FIRST ANNUAL

ELECTRIC ENERGY

FORUM

PROCEEDINGS

Efficient Use of Electricity with Demand Side Management

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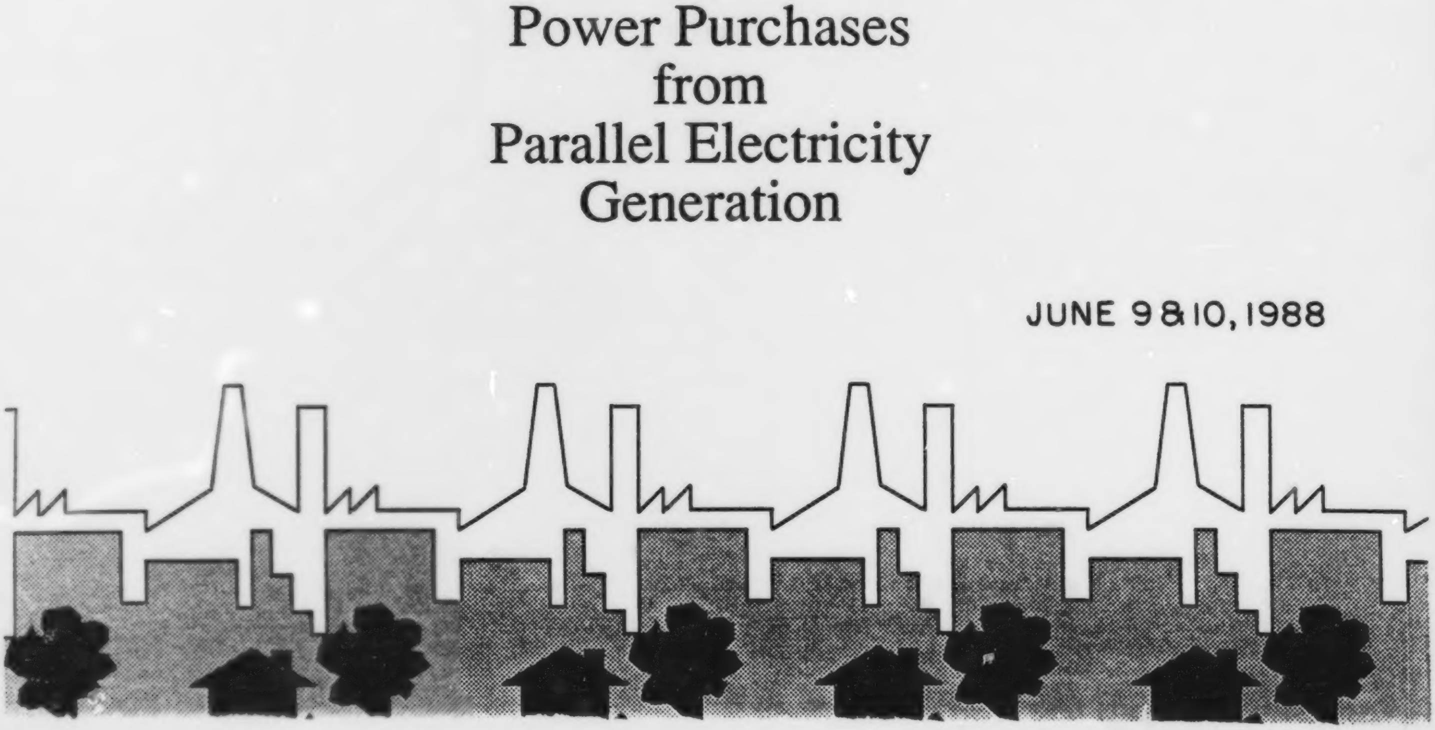
Power Purchases from Parallel Electricity Generation

JUNE 9 & 10, 1988



First Annual
Electric Energy Forum

June 9 & 10, 1988
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CONTENTS

Section | Subject | Page

SUMMARY

1 INTRODUCTIONS AND RESOURCE PLAN

Introduction and Welcome - Larry Bell, B. C. Hydro 1 - 1
Description of Conference Program - Bill Best, B. C. Hydro 1 - 6
B. C. Hydro's Electric Load Forecast and Proposed Resource Plan - Ken Peterson, B. C. Hydro 1 - 9
Defining Demand Side Management (DSM) and Parallel Generation - Tim Newton, B. C. Hydro 1 - 15

2 DSM PROGRAMS

The Role of DSM - John Sheehan, B. C. Hydro 2 - 1

Pacific Northwest Experience with DSM

Sue Hickey, Bonneville Power Administration 2 - 10
Ralph Cavanagh, Natural Resources Defense Council 2 - 22

Proposed DSM Programs

- Jack Habart, B. C. Hydro 2 - 34
- Zak El-Ramly, B. C. Hydro 2 - 37
- Derek Henriques, B. C. Hydro 2 - 47
The Potential for Energy Efficiency - Amory Lovins, Rocky Mountain Institute 2 - 55
Question Period 2 - 72

3 PARALLEL GENERATION

B. C. Hydro's Perspective:

Purchase Rates and Financial Parameters - John Elliott, B. C. Hydro 3 - 1
Interconnection Requirements and Wheeling - Bruce Prior, B. C. Hydro 3 - 4

CONTENTS - (Cont'd)

Section	Subject	Page
	Suppliers Perspective:	
	Small Hydro - Clyde Coats, The Coats Group	3 - 11
	Cogeneration at Cariboo Pulp and Paper Company - Arie van Donkelaar, Cariboo Pulp and Paper Company	3 - 20
	Public's Perspective - Dick Gathercole, B. C. Public Interest Advocacy Centre	3 - 24
	Making Parallel Generation Happen:	
	California's Experience - Bob Mussetter, California Energy Commission	3 - 32
	Ontario's Experience - Hedley Palmer, Ontario Hydro	3 - 39
	Electric Energy Development in B. C. - The Hon. Jack Davis, Minister of Energy, Mines and Petroleum Resources	3 - 43
4	DSM PANEL DISCUSSION WITH QUESTIONS AND ANSWERS	
	Panelists:	
	Hedley Palmer, Ontario Hydro - Panel Chairman Zak El-Ramly, B. C. Hydro Ralph Cavanagh, Natural Resources Defence Council John Sheehan, B. C. Hydro	4 - 1
	Demand Side Management Questions and Answers	4 - 21
5	PARALLEL GENERATION PANEL DISCUSSION WITH QUESTIONS AND ANSWERS	
	Panelists:	
	Ed Macgregor, MEMPR - Panel Chairman Chris Boatman, B. C. Hydro Bob Mussetter, California Energy Commission Arie van Donkelaar, Cariboo Pulp and Paper	5 - 1
	Purchase Policy Questions and Answers	5 - 18

CONTENTS - (Cont'd)

Section	Subject	Page
6	RESOURCE PLANNING PANEL DISCUSSION	
	Panelists:	
	Don McFarlane, B. C. Hydro - Panel Chairman John Allan, EMPR Dick Gathercole, B. C. Public Interest Advocacy Centre Ken Peterson, B. C. Hydro	6 - 1
	Concluding Remarks	6 - 15
7	HANDOUTS	
	The Speakers and Panelists	7 - 1
	Annual Corporate Planning Cycle	7 - 8
	Corporate Strategic Plan	7 - 9
	Demand Side Management	7 - 11
	Draft Policy on Purchase of Electricity by B. C. Hydro in Integrated and Non-Integrated Areas	7 - 13
8	SURVEYS	
	DSM Survey	8 - 1
	Power Purchase Survey	8 - 4
9	LIST OF ATTENDEES	9 - 1
10	NEWSPAPER CLIPPINGS	10 - 1

SUMMARY

The First Annual Electric Energy Forum was held to provide B.C. Hydro with the opportunity to present its forecasts and resource plans and to consult customers interested in demand-side management (DSM) and parallel generation. Almost 350 people representing industry, environmental groups, potential parallel generators and other interested members of the public met for a productive exchange of information and ideas on efficient energy use and non-utility supply.

The ideas generated at this forum will help Hydro in developing alternatives to meet future load growth. No longer does the construction of traditional, high-cost generating facilities appear to be the only way of meeting energy demands.

Hydro expects current resources combined with purchases from Alberta to meet energy demand until 1995. Beyond that time new resources are required. DSM programs are expected to free up 3,000 GW.h of energy annually while the potential for creation of available energy from parallel generation is even greater.

Hydro Chairman Larry Bell announced at the forum that the utility will ask private power producers to submit proposals for the development of up to 600 megawatts of generation in the Fall of 1988, representing as much as one billion dollars of investment. In his speech he outlined the draft policy on "Purchase of Electricity by B.C. Hydro". The policy invites the private sector for proposals with specific options for the domestic market, both in integrated and non-integrated areas and for the export market.

The Chairman then joined other attendees to hear presentations on DSM and parallel generation from people representing large utilities, small hydro, public advocacy groups, and industry.

INTRODUCTION AND WELCOME

(EDITED TRANSCRIPTION)

LARRY BELL

Chairman and Chief Executive Officer
B. C. HYDRO

It is a pleasure to welcome you to B. C. Hydro's First Annual Electric Energy Forum. I would like to welcome the many distinguished speakers who will be introduced individually by the Session Chairman. We very much appreciate their participation. They will provide a wide diversity of viewpoints and we look forward to being challenged by what they have to say. I would also like to thank the Ministry of Energy, Mines and Petroleum Resources for their co-sponsorship and I look forward to the Minister's speech tomorrow at noon.

This forum, which will become an annual event, will review B. C. Hydro's latest load forecast and resource plan. In addition, we plan to highlight certain policy areas where we can describe some new proposals. Your feedback will be an integral part of this forum. We look forward to your critical comments as we consider a variety of options to serve the electrical requirements of British Columbia.

Let me start by offering one or two comments to you about our Corporate Strategic Plan. There is a copy in your pamphlet and I would ask you to glance at it. It provides the context for all of our activities, including planning. The question we must ask ourselves is whether this activity, plan, or proposal is consistent with our objectives? We have defined our mission as that of supporting the economic growth of British Columbia by the efficient supply of electricity. We have four corporate objectives and we ask all of our employees to focus on these objectives.

The first is to maximize our contribution to the economic development of British Columbia. By that we mean, going beyond just the efficient supply of energy. We talk about our purchasing policies and about risk sharing with the private sector. Secondly, we seek to be, and indeed will be, the most efficient electrical utility in North America. We intend this to be demonstrably self-evident. Thirdly, we want to be recognized by our customers as a superior marketing and customer service company. We have an excellent rating by our customers in terms of our service reliability. We can improve in some areas in our commercial relationships and we are focusing on that. Of course, people make it all happen. Fourthly, we want to be recognized by our employees and by others as one of the best employers in British Columbia.

The two special topics of our conference, demand side management and parallel generation are consistent and designed to be an integral part of our strategic plan.

Let me move then to some comments on our power purchase proposal call which has not been discussed in public previously. It is one which we ask you to focus on over the next couple of days. We are looking increasingly to a non-utility supply for future loads. The more we learn about the experience in the industry and the balance of North America, the more convinced we are that this will lead to greater efficiencies in British Columbia. Having said that, and having attempted to learn from experiences of other jurisdictions, we still intend to move cautiously and carefully to ensure that we have quality projects that provide, not only cost savings, but security of supply.

Currently we see four opportunities in the near future to begin to develop non-utility supply and we intend to issue proposal calls this fall. First the export market. We have identified, by the mid-nineties, an export opportunity in the Pacific Northwest and are working cooperatively with two investor utilities as well as BPA. A proposal call will be issued this fall for approximately 400 MW to determine what opportunities there are to serve this market. At the same time we will be exploring terms with potential purchasers. This represents in the order of $600 to $800 million of investment and could generate revenues, on an annual basis, of $100 million. I would add that, in the late nineties, we also see a further export opportunity.

Let us now move to our domestic requirements. Our Twenty Year Resource Plan which will be discussed later this morning calls for cogeneration of up to 2,500 GWh depending on load growth. In order to stimulate the development of this resource and to learn more about how to deal with the industry, B. C. Hydro will issue a proposal call this fall for 150 MW. Direct investment would be in the order of $100 - $200 million. Proposals could be in the form of one large project or several small ones. We really do not know what the supply options are and that is why we look forward to the results of this proposal call. Early indications, from a number of you in the audience and others, indicate that we will be pleasantly surprised by the amount of cost-effective energy that is out there. This will be the first of our planned annual calls for proposals for independent power sources and cogeneration.

The third proposal deals with B. C. Hydro's non-integrated or diesel supply areas. To service these areas costs millions of dollars in excess of our costs. A number of you in the audience are aware that the operating costs of running a diesel system are in the order of three to four times the equivalent costs for our integrated system. We believe that there are cost effective alternatives out there and that a competitive bidding process will allow us to evaluate the best of these. We already have some experience. We are currently negotiating with Queen Charlotte Power Corporation to provide a small hydro project in the Sandspit area. This is a result of a proposal call some two and a half years ago and a principal of that company will be addressing you during this forum. We must do a lot of learning, both of us, and we think that, with this learning and a project with which we are particularly happy, we will be much more efficient at this process in the future. I say small hydro -- this is a $10 million project. It is small in the context of a Revelstoke or Site C.

We will be issuing a series of proposal calls this fall to supply specific non-integrated areas. These proposal calls may well include expressions of interest to manage both the supply and distribution of electricity. We provide service in eleven diesel districts at the present. One, Stewart, as some of you are aware, is in the process of integration. Two others, Sandspit and Atlin have specific proposals under consideration now. I have already mentioned Sandspit. For Atlin we are having discussions with people in the Yukon, where it would appear to be much more efficient for them to serve this area. Fort Nelson, by far the largest at about 15 MW out of our total diesel load of 35 MW in 1987, will be the subject of a separate proposal call. The remaining seven districts have a combined load of about 10 MW. The largest are Bella Coola on the Mainland and Masset on the Queen Charlottes. Again, expressions of interest have been received on serving these loads. All alternatives will be considered. In particular, in Masset we are very interested in a proposal that would see a manufacturing process linked to the use of wood waste and the cogeneration of electricity.

These proposal calls represent potential investment in the order of $15 - $20 million and would provide significant cost reductions to B. C. Hydro. Fort Nelson, the only large community outside of our grid, has for many years looked for an opportunity to have competitive power supply costs in order to attract industry. There are increasingly strong signs that a major pulp mill investment could be forthcoming and we will be issuing a proposal call for service to Fort Nelson this fall to serve either the existing load of about 15 MW or that load plus a pulp mill which we estimate would have a load in the order of an additional 50 MW.

Now, while integration via a transmission line is assumed to be the most economic supply alternative to serve extra load, there are indications that there are other options. Westcoast Energy, for example, has presented us with an attractive feasibility proposal which appears to offer significant advantages. With the location near the gas fields and an efficient development in gas turbine generation, it is conceivable that both integration and independent power supply could occur in Fort Nelson. Actually, there is some prospect of exporting power out of that area into the major grid. Indeed, we have had expressions of interest from Alberta. We started our discussion by saying there was no way we could be integrated into their grid, but we are now exploring a variety of opportunities open to us and we may indeed be selling power to Alberta. Investment in the power plant would be in the order of a $100 million. The transmission line has been estimated at $65 million, so we want to have an opportunity to evaluate all the alternatives prior to making this key decision.

In addition, we are close to finalizing a proposal for cogeneration as part of Canfor's upgrade of its mill at Port Mellon. Here we have been able to structure an arrangement where we can take advantage of their tax position, their ability to manage construction risk and our ability to raise funds economically. When this opportunity came along we left all of the options open in an attempt to structure a deal which is advantageous to both parties. We have learned a lot from those negotiations and we think we are very close to a contract which will see some 50 and 60 MW of power cogenerated at this pulp mill.

I would like to add that, in evaluating these proposals, while price and quality are paramount, environmental impact and regional economics clearly have to be considered. We have not worked out who is to make those judgements. We do not think that it is appropriately a B. C. Hydro decision alone. There are some opportunities, for example in wood waste disposal, where we would be making a positive contribution to the environment. Some of you are aware that a number of interior communities have a very significant problem with fly ash. We have in the audience today somebody from Washington Water Power who put together one of the best models of wood waste generating plants in North America and some of you may want to take an opportunity to introduce yourself to him.

In addition, while commenting on independent power, cogeneration and the commercial opportunities that are there, let me add one or two supplementary comments. First of all, we will have, and it will be discussed during the conference, a separate process for 5 MW or less. There will be different timing with respect to these smaller projects. We are very concerned about being able to utilize these opportunities while at the same time keeping our transaction costs down, so we will look for a much simpler process for these projects.

In addition, we will discuss our proposed wheeling policy. We see wheeling as a commercial opportunity for B. C. Hydro, and for our rate payers. The Minister may comment further tomorrow, but it is proposed that, at this time, that for existing customers we would only wheel incremental load from independent power sources.

Lastly, with respect to the second half of our agenda, and I am sorry that time did permit me to talk about our demand side management program, there are some of the many fine initiatives under way. We have very high expectations, and I would like to draw your attention to our interest in seeking opportunities to have some of these demand side management programs put out for tender in order that they be considered in parallel with the purchase of electricity. We are looking to a bid process, where appropriate, to buy savings from conservation.

In conclusion, this our first forum and we look forward to your feedback. There is a form in your package and we would ask that you take the time to fill it out, to tell us how useful you found the topics and the forum itself. This will guide us for future events. I would like to point out as well that this is not the only opportunity for public dialogue on our resource plans and policies. We would welcome any written communication from you or from others over the summer and any suggestions that you may have, as we are committed to a process of public participation and consultation in our planning activities. You will see again, in your kit, an outline of the annual planning cycle which we go through. You will see that our resource plans are 20 year plans, so if we do not respond in a positive way to your suggestion this year, remember that we are well on our way to developing a 20 year plan for next year and maybe we will include it in the next cycle.

In conclusion then, welcome! I hope you find the next two days interesting and of benefit personally and professionally.

I am now going to turn the Forum over to Bill Best. A number of you will know Bill Best; he started with the B. C. Power Commission in 1958 and when I introduced Bill a month or so ago I introduced him as our "renaissance man". He has probably held every job in the corporation with the exception of being a meter reader, but he corrected me on that. He has also been a meter reader. Now for those of you who do not know Bill, when you see this youthful fellow come up here you will be as perplexed and puzzled as I, and feel slightly jealous, that a fellow like this can opt for early retirement. Our early retirement date was April 1, but we twisted Bill's arm and have kept him here for another six months. We are delighted that Bill is here and if anybody in B. C. Hydro has the ability, demonstrated through his career, to chair this forum it is Bill Best.

DESCRIPTION OF CONFERENCE PROGRAM

(EDITED TRANSCRIPTION)

BILL BEST

Vice-President on Special Assignment
B. C. HYDRO

Thank you very much Larry and welcome ladies and gentlemen. I only wish I was eligible for merit review this year with that kind of an introduction. We at B. C. Hydro and with the Energy Ministry are delighted to see such a tremendous turn out here this morning in spite of the first day of nice day weather that we have had for a long time. We cannot see it, so we will just assume the weather is like it has been in the past and I am sure we will all concentrate on the subject we have to deal with here today. I am also delighted that Larry Bell asked me to chair these proceedings over the next couple of days because, for me, this is the culmination of a lot of work that I have had the pleasure of being involved in with B. C. Hydro.

It is a bit of an unveiling, of some new plans, some new ideas, some new approaches to electric system planning in the province which I think you will find interesting and also help us to put the final touches on plans -- to the extent that you can ever put final touches on plans. In the 30 years that I have worked in the utility, starting as a meter-reader and even climbing a few poles, I spent 24 of those years as an operating manager throughout the province, working in various communities and on various jobs. During last six or seven years I have had a change in career. I have come into the corporate offices of B. C. Hydro and been involved in something that I had not been that much involved in before. Activities like load forecasting, system planning, marketing and customer services -- from a corporate point of view.

I can tell you that these last six or seven years for all of us in the utility business, and all of us in the energy business, have been most exciting, and at times, even traumatic. The plans and the approaches that we were taking six or seven years ago have been turned completely upside down and inside out. We have done a lot of hard work internally, reviewing, looking at different approaches, seeing what other utilities are doing, talking with our colleagues, critics and supporters, trying to come up with some new ideas and new plans. That is what we want to share with you over the next two days. Plans should be flexible, pliable and able to change. Because you are our customers, and some of you are our future suppliers, it is imperative that you have an understanding of where we are coming from, why we have done what we have done and that we have an understanding of how those plans should be modified or changed to meet the requirements of our customers and our suppliers.

In passing, I would also comment that this process required changes for people within B. C. Hydro. Six or seven years ago we had a very ambitious building program to meet what we thought were the demands and loads of the day. They did not materialize. The economy did a complete turn around. We wound down and took major projects such as Site C and Hat Creek off the planning boards. We had a surplus on our hands when Revelstoke came into service. We have been able to successfully market that surplus to the point that we did not waste any of that energy. We received good revenue from it to help keep the rates down in the province and also to help industry with some discount rates. At the same time we did not commit ourselves for the sale of that electricity, so that we do not need a new expensive plant for the future.

The purpose of the "First Annual Electric Energy Forum" is to describe B. C. Hydro's electric load forecast, resource plan, proposed Demand Side Management (DSM) programs and draft power purchase policy; to determine what others are doing in these areas; and to solicit your views in order to provide better, more responsive programs and policies. The various speakers will decribe the DSM programs, how they can be of benefit to both you and B. C. Hydro and the role of parallel generation from the parallel generator's, the public's and B. C. Hydro's perspectives. With these matters being examined by the other speakers, I would like to emphasize the opportunities for you to participate in the formulation of the DSM programs and a policy on power purchase from parallel generators.

We look forward to receiving your input because it is that communication from you, our customers, that will make this Forum a success. Your opportunities for providing input include:

1. Questions after each speakers presentation (as time permits).

2. A question period at the end of the first day.

3. Question sheets in your Information Packages. There are three of these question sheets: "Load Forecasting and Resource Planning", "Demand Side Management" and "Parallel Generation". As questions arise jot them down on your question sheets. Then ask your question(s) at the end of the presentation, during the question period or during the appropriate panel discussion. If you have questions for both panels during the simultaneous sessions on Friday afternoon, attend one panel and leave your questions for the other panel at the Registration/Information desk in the foyer, outside this room. Any questions that remain unanswered at the end of the Forum will be addressed later and the answers included with the proceedings that will be sent to each delegate.

4. Questionnaires on DSM and the Power Purchase Policy are also included in your information package in order to obtain your opinions on specific aspects of the DSM programs and the power purchase policy.

5. Request for Information sheets are included so that you can direct questions to B. C. Hydro on topics which were not covered in the Forum, but are related to DSM or Parallel Generation.

6. In a Critique of the Forum we welcome your comments on the format, the quality of papers presented and on the adequacy of the facilities here at the hotel. This information will help us to

improve for the "Second Annual Electric Energy Forum", next year at a date yet to be announced.

7. Committee members are available to answer questions. They are identified by the red ribbons attached to their nametags.

This is what the Forum will be about - providing you with our concepts and obtaining feedback from you to improve on these concepts and put them into action.

B. C. HYDRO'S ELECTRIC LOAD FORECAST AND PROPOSED RESOURCE PLAN

(EDITED TRANSCRIPTION)

KEN PETERSON

Policy and Planning Manager
CORPORATE AFFAIRS
B. C. HYDRO

When I started out with Hydro 11 years ago I was a junior in the Generation Planning Department. When things went well, that is, when we got projects timed correctly, we said, "Well, that was probably a result of good planning".

When things did not go right we said, "No doubt it was the forecasters' problem. They gave us a bad forecast, you can't get a good plan with a bad forecast".

A few years later I moved into forecasting and I saw the world from a completely different perspective. Then it became clear that the forecasts were fine it was just that the plans were lacking.

Well a couple of months ago they said, "We've got an offer you can't refuse ... we want you to look after forecasting and planning". That meant there was no place to hide.

Since I have to take responsibility for the whole thing, I would like to start with the errors of the past. This chart is kind of messy, but then this business of forecasting and planning is kind of messy too (Exhibit 1). The thick black line is our actual load growth over time. All those other lines taking off into space are the forecasts that we have made, with great faith and regularity, of the anticipated load growth. The interesting thing to note is that in the 1960s we were forecasting less than the actual load growth. In the 1970s, like many other utilities, we overshot the mark. We were much higher than actual. Now that we are into the 1980s we appear to be on trend, but I am not so sure that we have got it right. I do not know that it is even the right question; I believe that we have to look at both of these functions in combination.

That is what we will do over the next 20 minutes, to see how B. C. Hydro has arrived at its resource plan. One thing to note is that the consequences of error in the early days, when we were underestimating demand, were quite different from the consequences later when we were overestimating it. If a load could not be served, especially a large industrial load, it did not appear on the system. However, if we overestimated and built a plant, it was there and we had to pay for it even when the load to support the new generation did not materialize.

What this has led to in forecasting terms is what someone delightfully dubbed as 'the jaws of uncertainty' (Exhibit 2). If you cannot get a single line forecast right then you ought to be able to get a range into which the actual load will fall. Now it is easy to be critical of this kind of a process, to say that with such a wide band you are bound to be right, but, in fact, this is the state of uncertainty when looking at future load growth. I think you will find that across North America utilities are adopting this approach.

We are looking at a range from low to high of about 2% to about 4% which is less than half of the percentage increases that we were forecasting as recently as 10 years ago when 6%, 7% and 8% annual forecasts were common. Clearly, we know a lot more about the likely growth patterns of resource development in the province than we did a few years ago. I think our forecasting has improved significantly as a result. However, with the increasing global competition and the amount of uncertainty in the international economy, and with B. C. being just one small component of that economy, we must plan for that kind of environment. The challenge is still the same: how do you get the right combination of resources in service at the right time?

In the 1970s the response to the planning or forecasting errors of the 1960s was, "We've got to build resources faster, we've got to make sure that the signals are there so that the plants come onstream on time". So we changed the forecasting process a little bit. We said, "Here's a high target, shoot for it. That'll make sure that we've got the plants there when we need them". Bad timing. We instituted that process just about the time of the first oil crisis. We know what happened then; load tailed off and the plants that were built to those forecasts came in substantially early. The early 1980s response, and I am talking about our own response in planning at B. C. Hydro, to the errors of the 1970s was to say, "Let's plan to build only to what we can be sure is going to happen". We called that planning firm resources to serve firm loads. I think, in retrospect, that it was probably the same kind of error, in planning terms, as the previous one. Since that time we have tried to adjust, to take account of the uncertainty on both sides of the equation, both the forecasting and the planning side.

The current watchword is flexibility. We need flexibility in our plan to recognize the uncertainty in the forecast, and that tends to put a premium on short lead-time resources of the kind that we are going to be talking about today -- demand side management and some of the smaller scale shorter lead-time cogeneration and parallel generation projects.

If we look at the resource development potential in the province, we see on the left-hand side of Exhibit 3, the still enormous undeveloped hydroelectric resources we have. Included in the uncertain development portion of the chart is the potential of developing the Fraser River that no one gives any credence to being able to develop for hydroelectric purposes. But even in the viable development (what we have considered to be potentially developable projects for Hydro), it is as large as our current system. We have also got large thermal resources, coal and gas. Looking at the other range of resources on the right-hand side of the chart: cogeneration, wood waste, small hydro, the return of the Columbia downstream benefits, purchase and coordination with Alcan, coordination with Alberta, strategic conservation or demand side management. They are all relatively small, but still significant. For example, 8,000 GW.h for strategic conservation potential is equivalent to nearly two Site Cs.

I think it is fair to say that in the past, when load was growing quickly, we tended to look at potential in those terms. In other words, the hydro and thermal resource potential was so large, and apparently so cost-effective, that we did not look beyond it. The other resources were too small and too uncertain. Now the emphasis has switched. If you were to redo this chart in terms of the emphasis that we have in our plan, it is reversed. Now we are looking to coordination, conservation and cogeneration opportunities first, before we look at the large scale thermal and hydro projects.

This chart (Exhibit 4) compares the cost and relative size of some of the resources that we are contemplating. From it you get a very clear indication of the problem with some of the large hydroelectric projects. They are too big, given the load growth that we are forecasting. Developing them would be too costly unless there is a very clear and secure load either in the export market or in domestic industrial development. The costs for cogeneration, BPA coordination and so on, are much more competitive than some of the larger projects, in that the actual cost, the effective cost of bringing a resource on, is critically dependent on the timing. If it comes on stream before it is needed, it will be more costly because it has to be spread over a smaller number of customers.

The firm hydroelectric capability is based on a wide variability in the potential production of hydroelectric resources in the province and the existing installed hydro capacity (Exhibit 5). The production that would have come out of those projects if the historical streamflow on record had been run through them is illustrated. This is the kind of variation you get, from the very low to the very high is 10,000 - 15,000 GW.h, in other words, two to three Site Cs. Obviously you cannot depend on high water, you need to plan for something less than average water, in order to be able to meet the loads at all times. These gaps are filled in by potentially running Burrard or buying non-firm resources.

This figure illustrates what our recommended resource plan looks like now (Exhibit 6-1). You might say, as Bill mentioned, that this is a draft plan. It is all nicely published and there is a beautiful chart here, but we are just beginning this process. Plans of the past had firm in-service dates for large-scale projects. We do not know the extent to which we can rely on our demand side management and other, what used to be called "softer", options. We are confident that the estimates we have here can be achieved or even exceeded, but until we start to get actual results we cannot be sure. The blue base is our existing firm Hydro system. We add to that our demand side management programs. Then comes coordination with BPA which will firm up some of our secondary hydro (our surplus over firm capability) by operating the reservoirs in such a way that they increase their firm capability and we increase ours, and we share that. Next is the purchase from Alcan. Alcan has the go ahead to complete their Kemano project. We are negotiating to purchase energy from them for a period of about 15 years, extendable for 5 year periods depending on when and if they need the power for additional smelter capacity.

The Columbia downstream benefits start to return to British Columbia in 1998. That is a significant block of energy, the equivalent of about a Site C. Those downstream benefits are power generated at U. S. generators from water stored in Canada. At the very tail-end of the plan, if our load continues to grow, we schedule new hydro resources and these are Site C and Keenleyside-Murphy. At the end of the 20 years we put in a new thermal resource. For the purpose of the plan, this is Hat Creek. Now how does that compare to our load growth, especially our jaws of uncertainty?

In this figure there are the five forecasts superimposed on the resource plan. You can see that on the "probable line" that the resource additions do not quite match the forecast (Exhibit 6-2). The heavier shading in yellow relates to the Burrard Thermal Plant, in other words, with the probable load forecast we would have to burn some gas at Burrard. If we got to the high end of the forecast we would rely increasingly on what are called non-firm resources, such as purchases from Alberta. At the low end we would do some rescheduling, and we would relax the Burrard plant. The next chart shows these things (Exhibit 6-3). If we were to follow the higher forecast, we would advance our hydro and our thermal plants and use both existing thermal and some purchases. If the present low forecast appear to be more probable we would have some surpluses, we would not require any thermal resources and we would defer all major new plants.

This is a dynamic process. It is not something that you can fix for a 10 year period or a 20 year period even though we call it a 20 year resource plan. It is a snapshot that changes, and it changes more than once a year too because of changes in load growth and changes in resource availability. It is something that we monitor on an ongoing basis.

I mentioned the demand side management programs (DSM). I will briefly show you a chart (Exhibit 6) and others will describe it in more detail later in the program. Starting with a very low base of less than 100 GW.h in this current fiscal year, we expect to be able to acquire, that is, to reduce our load requirements by that amount. We expect to be able to increase our DSM recovery by the end of the planning period to 4,000 GW.h; in other words, nearly the equivalent of a Site C. This is a major element in our plan. Similarly, the downstream benefits with a probable forecast of growth in the Pacific Northwest, will start in 1998/99 at a fairly low level and will increase quite rapidly and peak at nearly 5,000 GW.h, again, close to the output of Site C (Exhibit 7). We use Site C as our reference case because, as many of you know, we went through a detailed public hearing in 1981/82 on Site C and I was part of a panel that insisted that we needed that project in service by 1988. That was just prior to the recession and we all know what happened. If we had it in service today we would be scrambling around trying to sell all that surplus energy.

This chart (Exhibit 8) shows our marginal cost of energy production from proposed plan resource additions. This is important for our discussion of parallel generation because it becomes the target against which alternative resources will be evaluated. In the early period where we have some secondary hydro and the potential to burn gas at Burrard at low incremental cost based on today's low gas cost, and the potential to buy relatively low cost coal-fired generation from Alberta, the price tends to be pretty low -- under $0.02/kW.h, and rises in the long term to about the range of $0.035 - $0.04/kW.h. These are in uninflated dollars at today's estimates and they take into account the output of the plants over their effective lives. Of course, the first year financial costs are much higher for those types of projects. Still, if a parallel generator is going to provide cost effective energy to B. C. Hydro, in other words, energy that will not increase the rates to existing customers, that is approximately the range of prices that we would be expecting for the integrated system.

This chart (Exhibit 9) shows the timing for additions of new resources on our system. With parallel generation, including cogeneration, we have an estimate of up to 2,500 GW.h. That range is 0 - 2,500 GW.h because we do not know what the actual load growth will be. To the extent that cogeneration is something that can be put on-line much faster than large-scale projects, we can get it going earlier to meet demands. We will need that energy under certain load growth patterns as early as 1993. It is to that end that we have been negotiating a deal with Howe Sound Pulp and it is also to that end that we will be putting out a proposal call for an additional 150 MW this fall. We can not say for certain that we need it, but we are confident that it will be worthwhile going through the process to learn about it. We will be able to meld it effectively with our other resources either for temporary short-term exports, if they turn out to be surplus, or to meet domestic demand.

Coordination and purchase agreements of 4,300 GW.h will be negotiated in the 1989 to 1995 period. That is a combination of the deal with Alcan, coordination with BPA and possibly some coordination agreements with Alberta, whereby we would use their relatively low cost incremental coal-fired generation and in exchange provide them with our low cost capacity.

Demand side management will start now and increase over the planning horizon. The first new generation from the Keenleyside-Murphy or Site C projects would be required at the end of the 20 year period, after the year 2000. We also have the return of the Columbia River downstream benefits in this period. This is the snapshot of resource additions that will be required, based on the range of forecasts and the probable range of resources that are going to be available to us. It includes the variability in the Hydro system and the possibility that some of our plans may not turn out as we would like. There may be a lot more cogeneration out there, there may be less. We are going to find out.

The process of proposal calls for resources (Exhibit 10): we expect to have a draft resource plan based on an updated forecast and an updated look at our resource potentials in the fall of each year. On that basis we will issue a proposal call for projects of greater than 5 MW. It could be for zero resources, if that is the state of the economy at the time, or it could be for as much as the equivalent of a significant new hydroelectric project. This fall we are going to go for 150 MW on an experimental basis, and we think that an effective way to manage the process would be an annual proposal call in the October to December period of each year so that parallel generators will know the time when we will be issuing our outlook and inviting proposals from them.

For small projects under 5 MW, in order to keep our transaction costs down, we think it would be effective to have a window in the spring of the year, roughly April to June, which would provide an opportunity for small parallel generators to come in with their proposals. These are our ideas at this time and we would be interested in your feedback on them.

For the non-integrated system we will be going for a proposal call this fall. We are interested in new ideas because our average cost of generation is up to $0.25/kW.h depending on the site. Fuel costs alone are $0.07 - $0.10/kW.h. Our cost recovery is about one-third or less of that actual cost. That is something that all the ratepayers on the integrated system are paying for and I think it is in everybody's interest that alternative lower cost projects be found for that load.

Questions

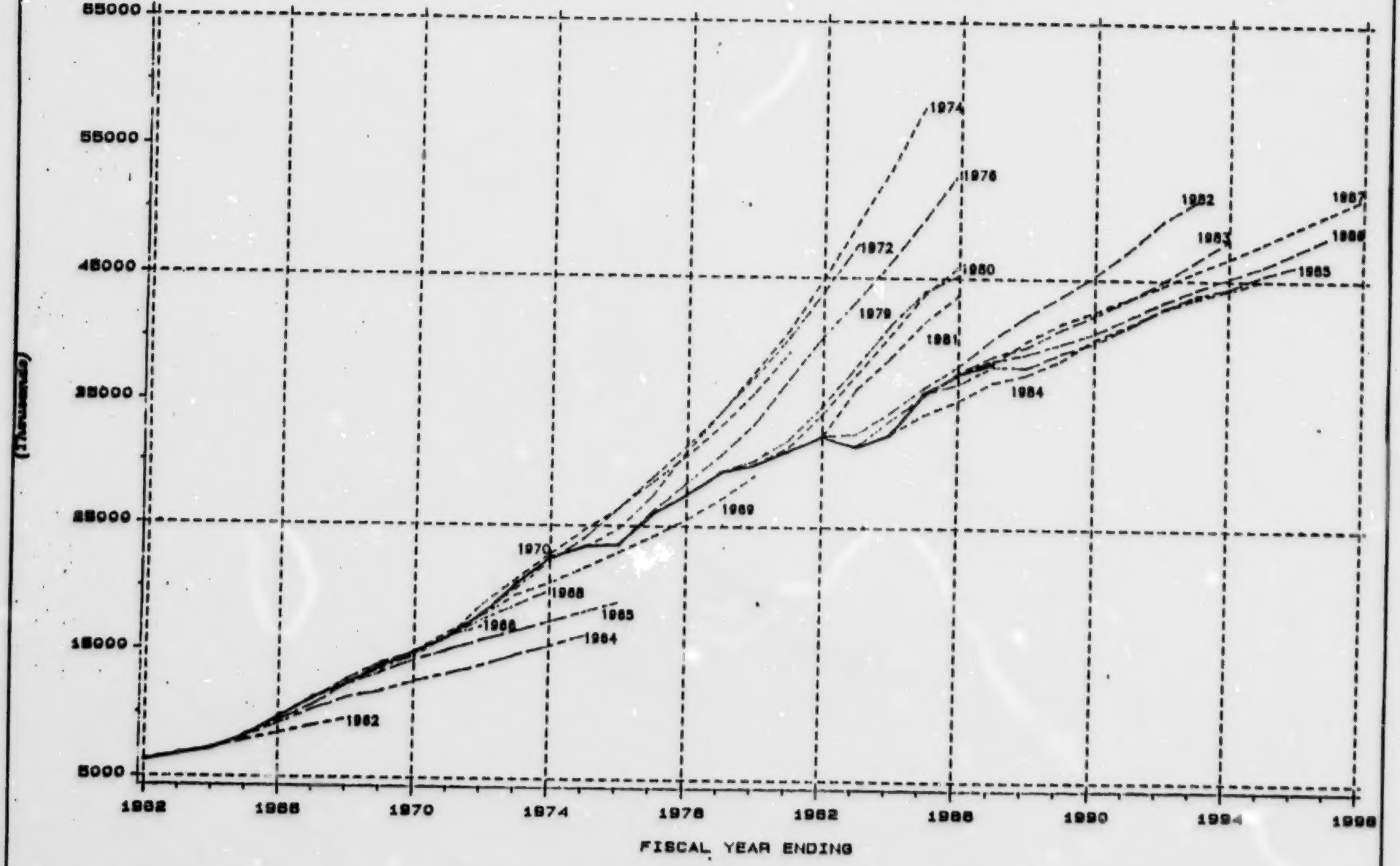
Gordon Bell, Three Valley Motel

Will there be a designated person within Hydro who we go to and who will make final decisions on these actions and each of the different phases that you are going to entertain proposals on?

Ken Peterson

Yes, there will be one contact point and that will be Mr. John Elliott. The decision-making rests with corporate management and the board, but we do intend to have a single contact point.

B.C.HYDRO – GROSS ELECTRIC REQUIREMENTS
COMPARISON OF ACTUAL WITH FORECAST MADE IN 1962 THROUGH 1987

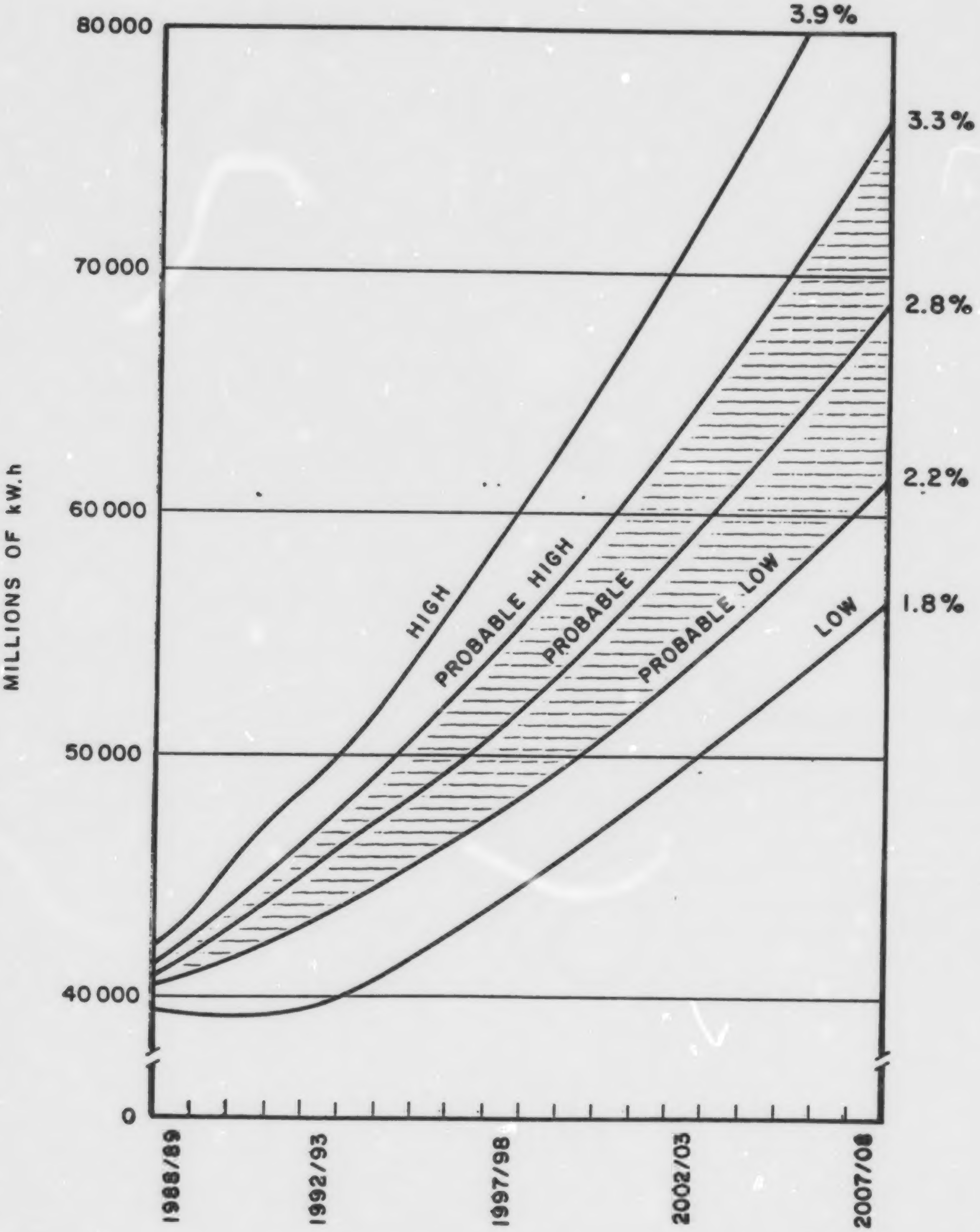


LOAD FORECAST DEPARTMENT

Exhibit 1

Exhibit 2

RANGE OF FORECAST DEMANDS



MARCH 1988

RESOURCE DEVELOPMENT POTENTIAL

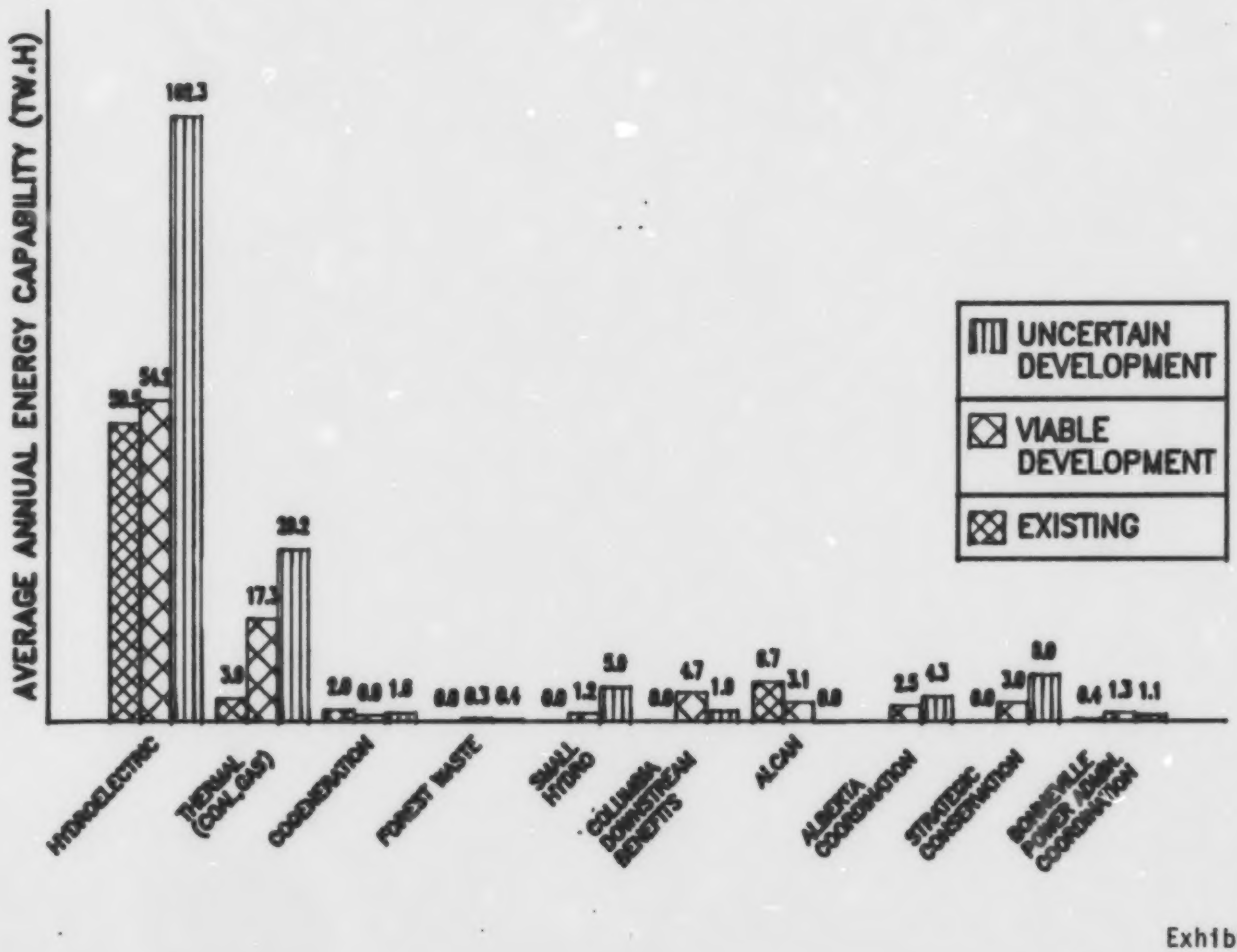


Exhibit 3

COMPARISON OF ENERGY COSTS AT 5% NET DISCOUNT RATE OVER PROJECT LIFE

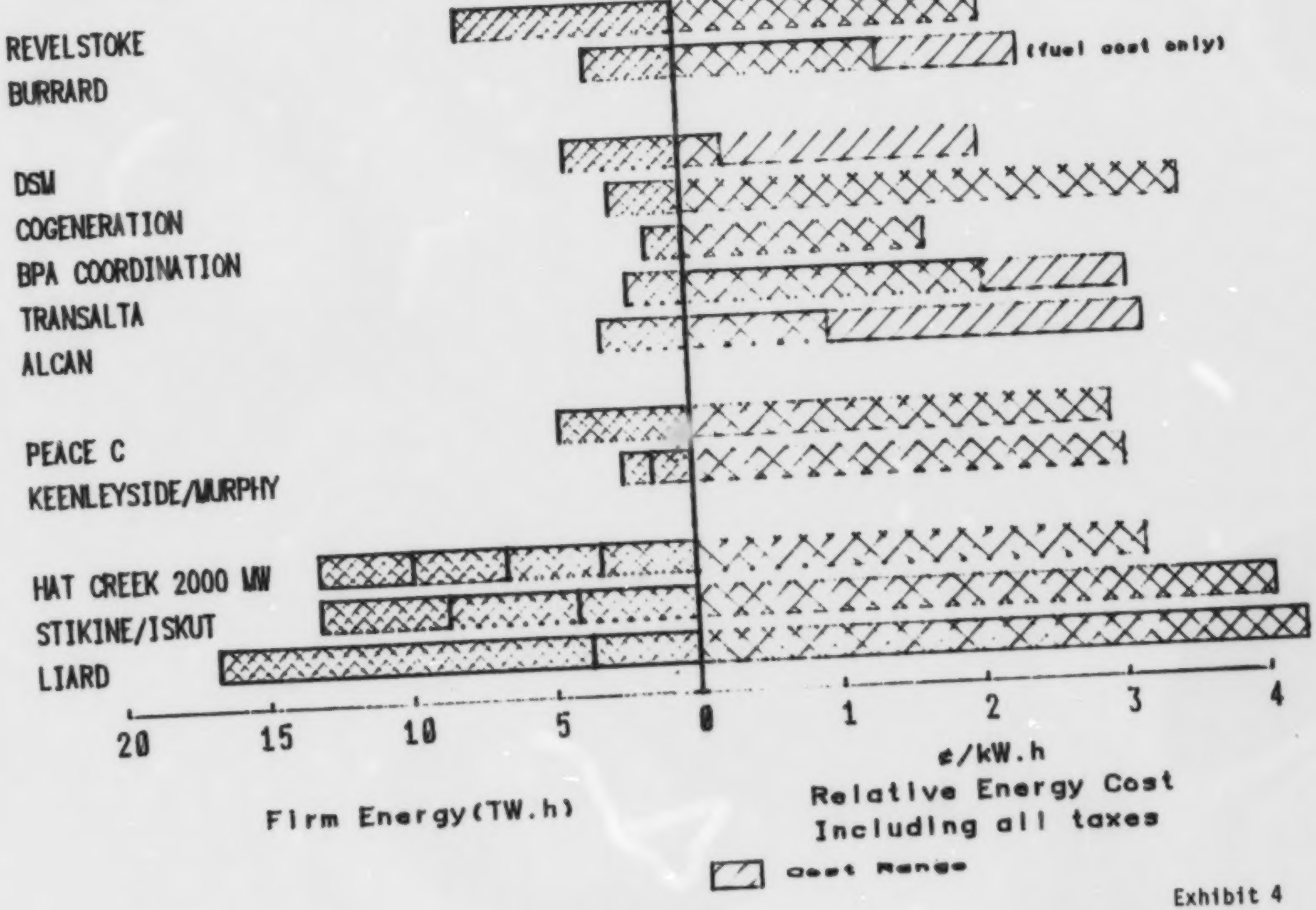


Exhibit 4

ENERGY CAPABILITY OF THE EXISTING SYSTEM FOR THE HISTORIC STREAMFLOW RECORD

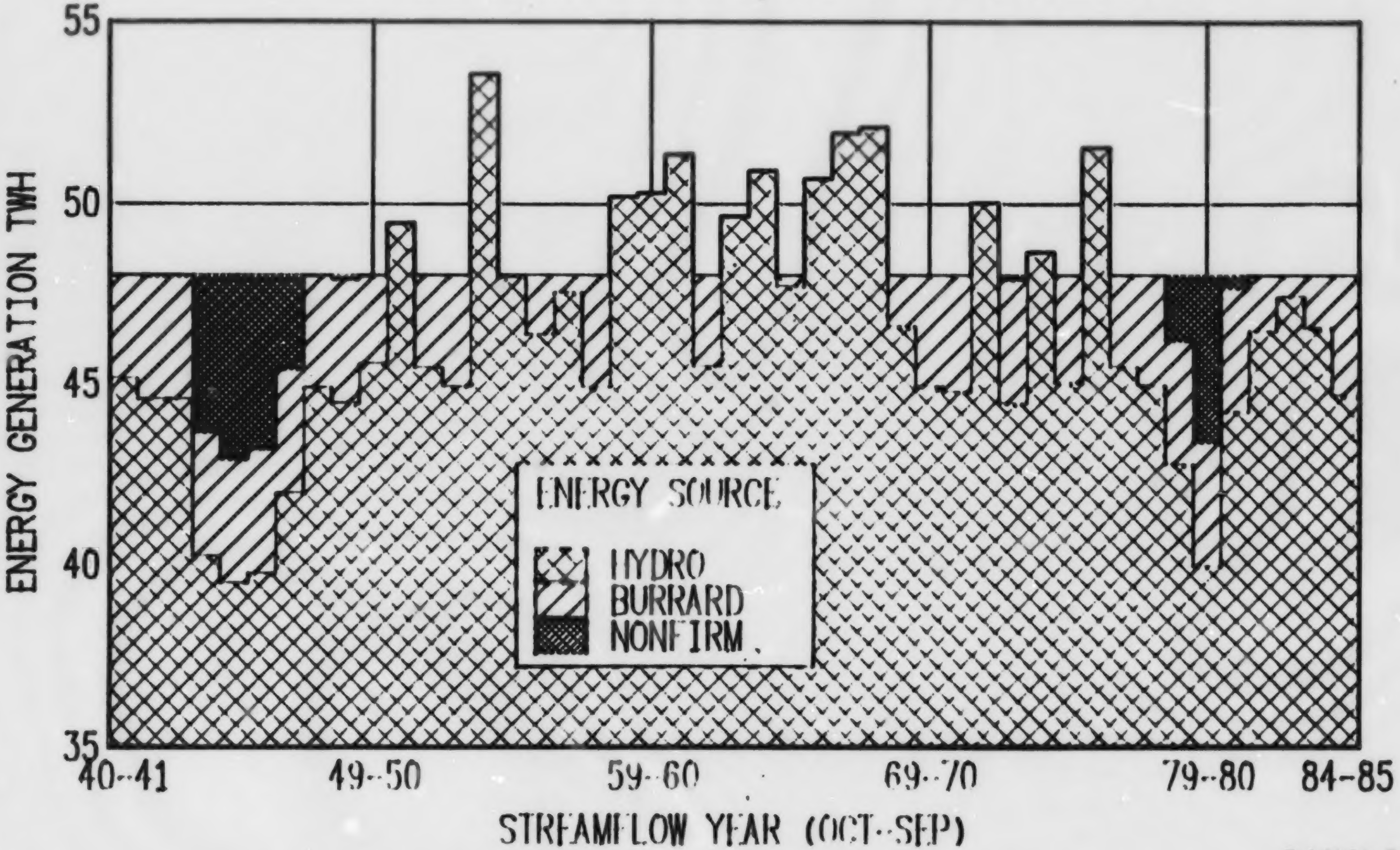
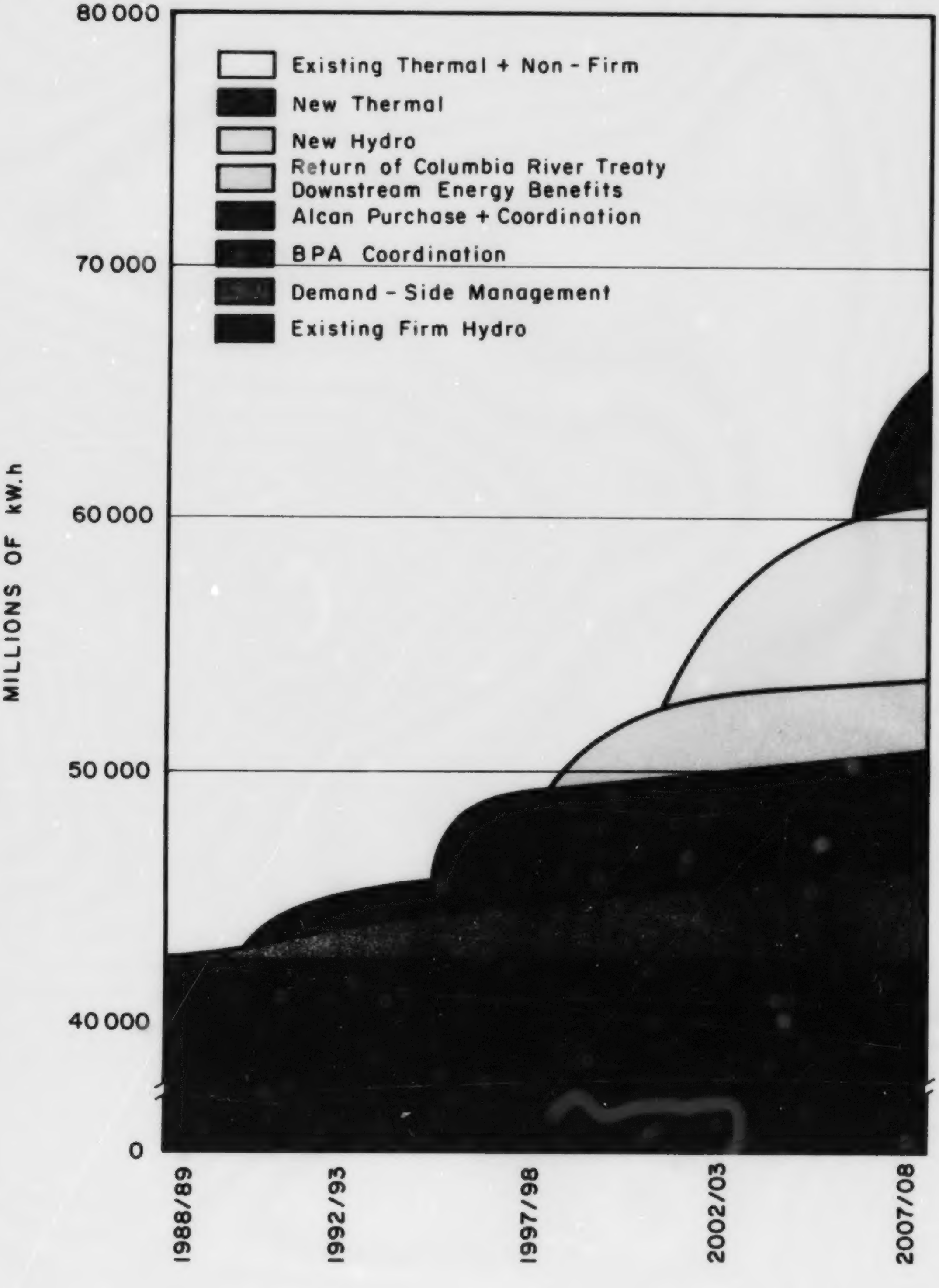


Exhibit 5

EXHIBIT 6-1

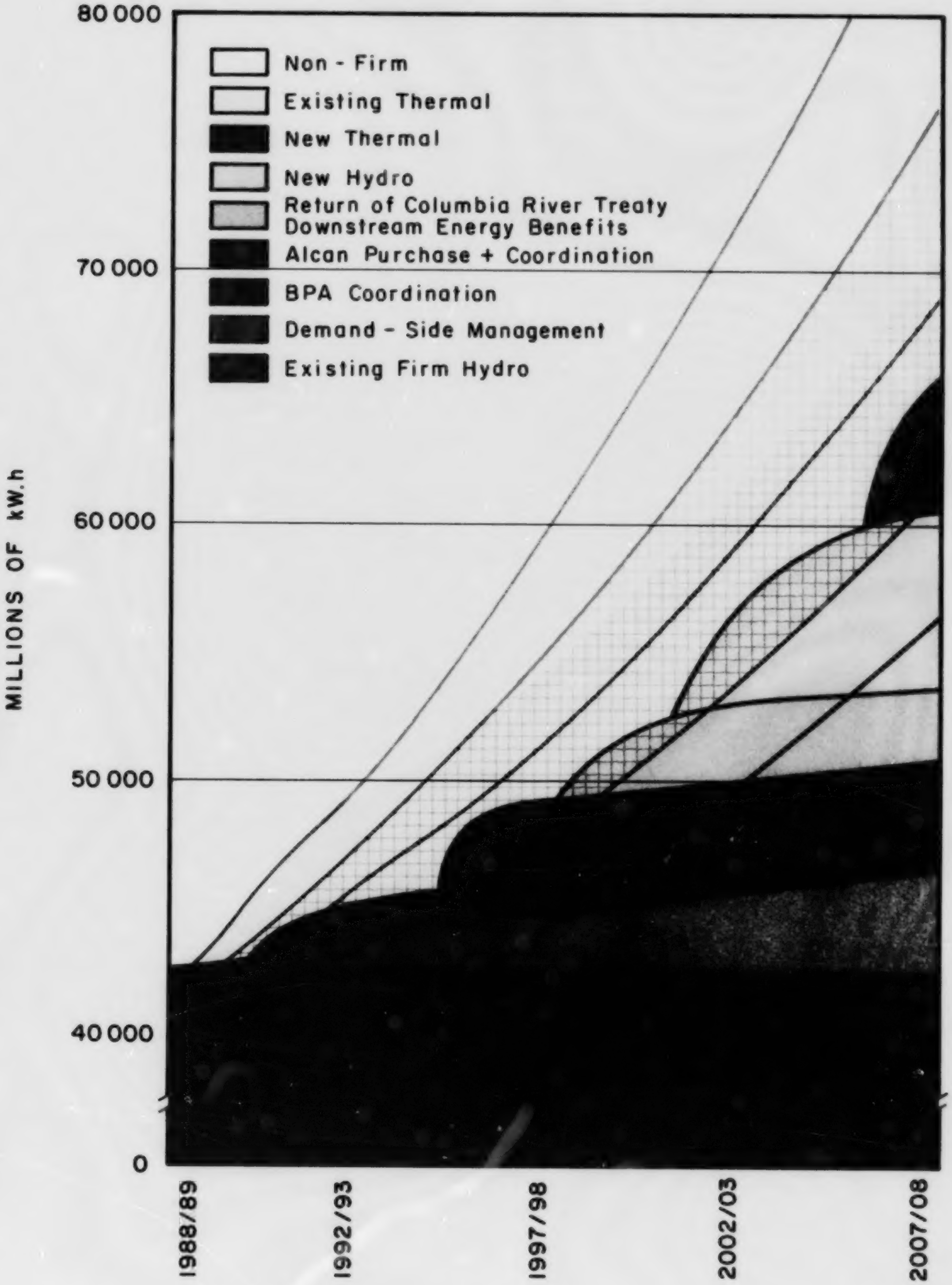
RECOMMENDED RESOURCE PLAN



MARCH 1988

EXHIBIT 6-2

RECOMMENDED RESOURCE PLAN TO MEET RANGE OF FORECAST DEMANDS



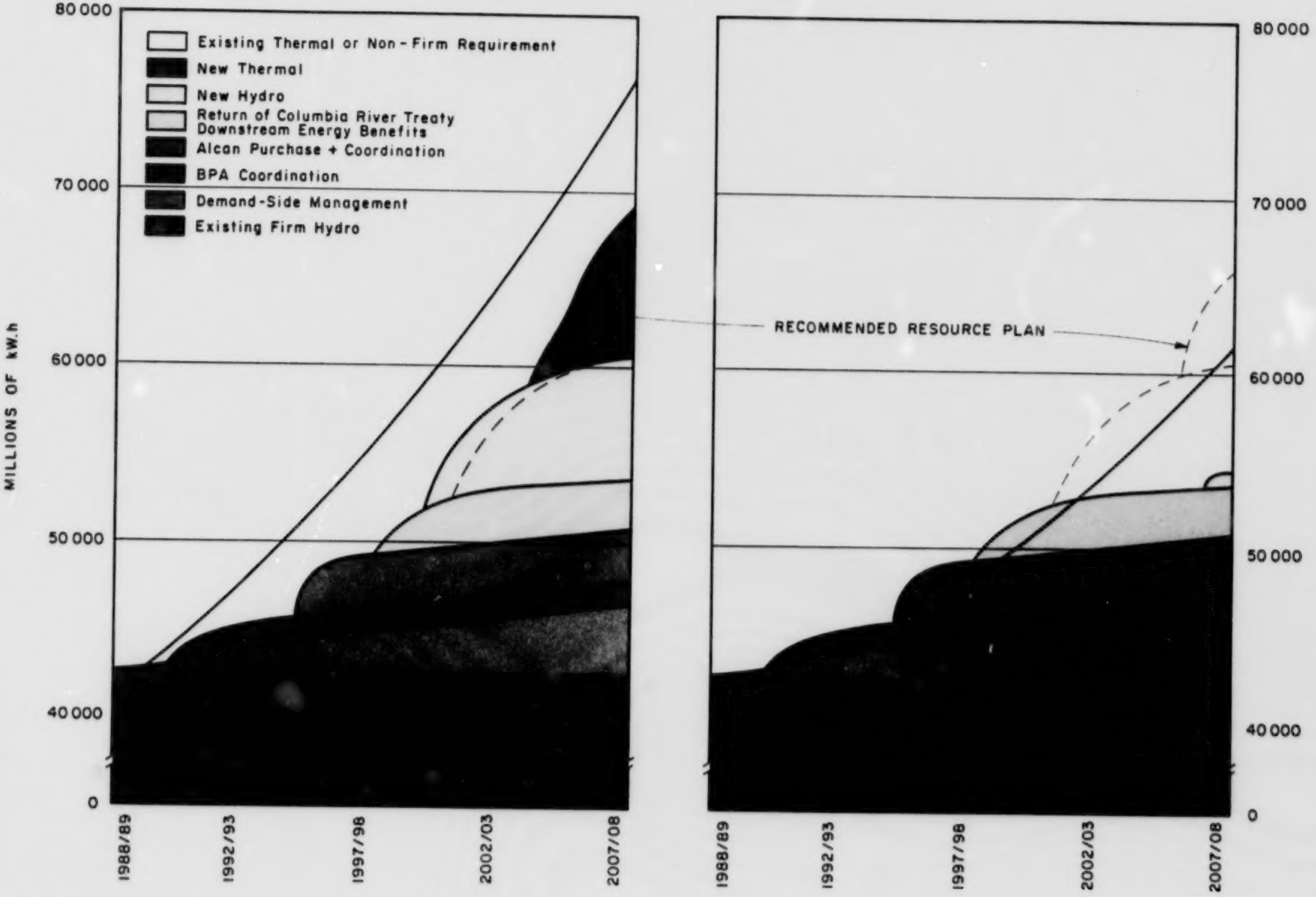
MARCH 1988

EXHIBIT 6-3

ALTERNATIVE RESOURCE PLANS TO MEET:

PROBABLE HIGH FORECAST

PROBABLE LOW FORECAST



MARCH 1988

Exhibit 6

PROJECTED DSM PROGRAM ENERGY SAVINGS

(Equivalent generation)*

	GW.h
1988/89	93
1989/90	287
1990/91	562
1991/92	901
1992/93	1239
1993/94	1586
1994/95	1822
1995/96	1938
1996/97	2073
1997/98	2200
1998/99	2355
1999/00	2462
2000/01	2617
2001/02	2783
2002/03	2943
2003/04	3117
2004/05	3305
2005/06	3498
2006/07	3705
2007/08	3890

*Include equivalent transmission and distribution losses.

Exhibit 7

CANADIAN ENTITLEMENT TO COLUMBIA RIVER TREATY DOWNSTREAM BENEFITS*

(Estimated Range of Annual Benefits as a function of the growth rate in the Pacific Northwest)**

Year	Energy Benefits (GW.h) Low PNW Growth	 Probable PNW Growth	 High PNW Growth	Capacity Benefits (MW) All forecasts
1998/99	620	480	360	100
1999/00	3670	2790	2060	600
2000/01	3670	2760	1990	600
2001/02	3680	2730	1920	600
2002/03	3690	2700	1850	600
2003/04	6600	4810	3230	1100
2004/05	6620	4760	3130	1100
2005/06	6640	4710	3030	1100
2006/07	6630	4660	2930	1100

*According to the Canada - B.C. agreement dated 8 July 1963, these downstream benefits "belong to B.C. absolutely for its own use".

**Based on BPA's 1986 forecast. 1987 forecast remained essentially unchanged.

Exhibit 8

MARGINAL COST OF ENERGY*
B. C. HYDRO INTEGRATED SYSTEM

1988 - 1991	1.4 - 1.5 ¢/KW.H
1992 - 1996	2.1 - 2.4 ¢/KW.H
1997 - 2000	2.8 - 3.1 ¢/KW.H
2001 ON	3.3 ¢/KW.H AVG.

* ASSUMPTIONS:
- 5% NET DISCOUNT RATE
- UNINFLATED DOLLARS
- INCLUDES ALL TAXES

14/3/16

Exhibit 9

TIMING FOR CAPACITY ADDITIONS
B. C. HYDRO INTEGRATED SYSTEM

	ANNUAL ENERGY CONTRIBUTION	TIMING
PARALLEL GENERATION (INCLUDING COGENERATION)	0 - 2500 GW.H	1993-2000
OTHER RESOURCES:		
COORDINATION, PURCHASES	4300 GW.H	1989/1995
DEMAND-SIDE MANAGEMENT	TO 3000 GW.H	1988 ON
NEW GENERATION	4700 GW.H	2001
COLUMBIA RIVER DOWNSTREAM BENEFITS*	TO 4800 GW.H	1998-2003

* EQUIVALENT ENERGY CONTRIBUTION REQUIRED FROM NEW GENERATION IF DOWNSTREAM BENEFITS ARE RESOLD TO THE U. S.

14/3/15

Exhibit 10

DRAFT

PROCESS FOR B. C. HYDRO TO ISSUE REQUESTS FOR PROPOSALS

TIMING	PROJECT TYPE	TARGET TOTAL
FALL (OCT - DEC)	INTEGRATED SYSTEM PROJECTS 5 MW CAPACITY OR GREATER	100 - 200 MW IN 1988
SPRING (APR - JUN)	INTEGRATED SYSTEM PROJECTS LESS THAN 5 MW CAPACITY	TO 25 MW
OPEN	PROJECTS FOR SERVICE IN NON-INTEGRATED AREAS	SPECIFIC TO LOCATION

14/3/18

DEFINING DEMAND SIDE MANAGEMENT AND PARALLEL GENERATION

(PRE-PRINT)

TIM NEWTON

Marketing Program Development Manager
CUSTOMER SERVICES
B. C. HYDRO

DEFINING DEMAND SIDE MANAGEMENT AND PARALLEL GENERATION

CONTENTS

Section	Subject	Page
1.0	INTRODUCTION	1 - 15
2.0	COGENERATION	1 - 15
3.0	GAS TURBINES	1 - 16
4.0	THE PARTICIPANTS	1 - 16
5.0	DEMAND SIDE MANAGEMENT	1 - 17
6.0	THE B. C. HYDRO ENVIRONMENT	1 - 17
7.0	COORDINATION	1 - 18
8.0	CONCLUSION	1 - 18

1.0 INTRODUCTION

"A rose by any other name would smell as sweet" according to Shakespeare, and I am sure the same can be said for DSM or Parallel Generation. However, when you are talking about flowers it is just as well to know which ones you are talking about. Many of the terms that crop up might seem just as unfamiliar as the Latin names that are used to classify flowers. Unfortunately they are not quite as well established, so that some of the definitions I use might have to be modified later. What I do hope to accomplish today is to have a common understanding of the issues, even if we do not share the same point of view.

The common base for both DSM and parallel generation is the better use of energy resources. Since energy is not strictly used up it is really a matter of making the best use of energy's ability to do useful work for us. This usefulness is directly proportional to the temperature of the working medium. However, sometimes we do not need the very high temperatures available. This provides an opportunity for a very effective mechanism described as energy cascading (Exhibit 1). The idea is to use high temperature energy to perform the tasks for which high temperature is most effective and then use the heat that is left over, at a lower temperature, to perform tasks that only need the lower temperature. You have to imagine energy cascading down from one level to the next, performing the appropriate tasks at each level.

2.0 COGENERATION

The idea of energy cascading is particularly important when dealing with electrical generation. One of the unfortunate facts is that heat cannot be turned into mechanical energy on a one for one basis, and there is always some heat that must be removed at a lower temperature (Exhibit 2). This gives rise to cogeneration, which is where useful energy in the form of both electricity and heat are produced in a single operation. This raises the overall efficiency with which the available energy is used. If the energy is first used at a high temperature to generate electricity, and then used for heating, the process is referred to as a topping cycle as the electricity is developed at the top of the energy cascade (Exhibit 3). On the other hand, if the energy is used to meet a need for high temperature steam, and afterwards used to generate electricity at a lower temperature it is called a bottoming cycle (Exhibit 4), as the electricity is produced near the bottom of the energy cascade. For a particular design the amount of electricity and the amount of useful heat are produced in a fixed ratio (Exhibit 5). This ratio depends mainly on the temperature requirements of the extracted heat. During operation the total output of the plant can be increased or decreased to meet the energy needs, but the operator must decide whether the adjustment is made to meet electricity needs or heat needs. Typically the owner is interested in meeting the heat requirements, so the electricity becomes a by-product, and the amount depends on heat needs (Exhibit 6). If this electricity is greater than the electric needs of the owner, he must sell, cut back on his cogenerator, or somehow bypass the electric part of the plant (Exhibit 7).

There are some special cases of cogeneration such as total energy systems where a cogeneration system is run to meet the heating needs of a building or complex, but the energy is first used to generate electricity. In these cases the amount of electricity produced depends on the heating load of the building or complex, but is typically less than the electrical needs of the building.

3.0 GAS TURBINES

An increasingly common form of generation is the gas turbine. Similar in many respects to jet engines, gas turbines can be acquired on comparatively short notice, and can be used to produce heat and electricity quite easily. First the fuel is burned to drive the engine, and the hot exhaust gases are used to meet heat requirements (Exhibit 8). This type of generation leads to another cycle you might meet in talking of generation - the combined cycle (Exhibit 9). In this case fuel is used both as a source of hot compressed gases, in the turbine and the exhaust gases are then used to drive another turbine. This allows greater efficiencies.

4.0 THE PARTICIPANTS

So much for the technicalities. One other important concern with generation is the ownership of the generation. The big distinction is between a regulated, usually monopolistic, utility on the one hand or a customer, or independent power producer on the other. The second group are referred to as non-utility producers. If they are the customers of a utility they are sometimes called customer generators, not to be confused with cogenerators as described earlier. If the non-utility generation is connected directly to the supply from the utility, it must run at exactly the same frequency as the supply. This is known as parallel generation - one of the two main topics of our Forum. You will see that cogeneration could also be parallel generation, but does not have to be, and parallel generation could also be cogeneration but does not have to be.

Some very important regulations in the United States have had a significant effect on the electrical industry, and have also given rise to some other terms you might come across today. Two sections of an act of congress, called the Public Utilities Regulatory Policies Act (known as PURPA) firstly define facilities which qualify for special treatment as parallel generators, and secondly specify the benefits they are entitled to, including the rates for utility purchases. The Federal Energy Regulating Commission (FERC) has developed implementing regulations which define qualifying facilities or QF's, as small power producers and cogeneration facilities. The regulation also specifies that the price that should be paid by the utility is equal to or less than the incremental or avoided cost of the utility. Some critics have charged that some of the QF's have been designed and operated to produce the maximum electricity possible with just enough use of waste heat to meet the regulations. Such facilities have been nick-named PURPA machines.

5.0 DEMAND SIDE MANAGEMENT

To balance the measures taken on the electricity supply side of the scale, utilities have been looking more and more seriously at what can be done to alter the load to reduce the costs of supplying electricity. The whole range of activities where the utility tries to influence the market is known as Demand Side Management, or DSM (Exhibit 10). There are a number of additional terms that have been used to describe particular actions (Exhibit 11). Load shifting is when the utility tries to switch load from heavy use times to times when there is less demand. Peak clipping is when load is removed from the heavy use time, or peak. Valley filling is when the utility tries to encourage loads that will only be turned on during times of light demand. Strategic load growth is when the utility tries to encourage more electrical use at key periods, such as at the time large new facilities come into service. Strategic conservation is when the utility tries to reduce the demand as part of a strategy, usually to delay the need for new facilities.

6.0 THE B. C. HYDRO ENVIRONMENT

The effectiveness of both parallel generation and DSM initiatives are very dependent on the particular utility. So let me point out some of the characteristics of our service area. We have a winter peaking load, as there is little summer air conditioning in most parts of the areas we serve, while there is a lot of winter space heating. Our energy comes mostly from falling water, or hydro resources. Most of our service area is served from a system of high voltage transmission lines, and we refer to this area as the Integrated System. The other non-integrated areas are for the most part served by diesel generators, and face much higher operating costs. For tariff purposes we refer to the integrated system as Zone I and while the non-integrated areas are Zone II.

As a result of the dominant hydro generation, and the generators needed to use all tne stream flow, we are easily able to meet the peak demands of our customers. In our case we need new projects to provide energy for new loads, regardless of the time of day or year the energy is used. This is similar to a car with a large engine and a small gas tank. If we want to go further we have to add to the gas tank, but the engine can easily carry us over the peaks. We describe ourselves as energy critical. Another characteristic of our hydro power is that the energy we get in any particular year depends on the rain in the two major river basins in which we have built our dams, the Peace and the Columbia. The system is designed to carry our expected firm load under even the worst conditions on record, but in most years we have better than this, so we can sell extra, or secondary energy.

7.0 COORDINATION

There is an advantage to pooling resources and loads between utilities, as this allows the systems to average the peaks and valleys in loads, rain and building programs. This sharing of loads and resources is known as coordination, and studies indicate there are some major benefits from coordinating with our neighbours. This is due to the very large storage dams we have on our system. Most of the benefits come in the form of firm energy in place of secondary energy.

8.0 CONCLUSION

Now let's look at the phrase we have chosen to use for our resource planning - Conservation, Cogeneration and Coordination. Conservation is basic to the much broader DSM programs we will be describing, and it catches the main aspect that increasing energy efficiency in energy use will save us and our customers money. Cogeneration is one important part of the parallel generation that we believe can also save us and our customers money in providing lower cost sources of electricity, and cooperating with our neighbours will add to the same end.

I hope that I have covered any terms that are a little unfamiliar, and that I have contributed to the better understanding that is so important to this Forum.

Parallel Generation

Energy Cascade

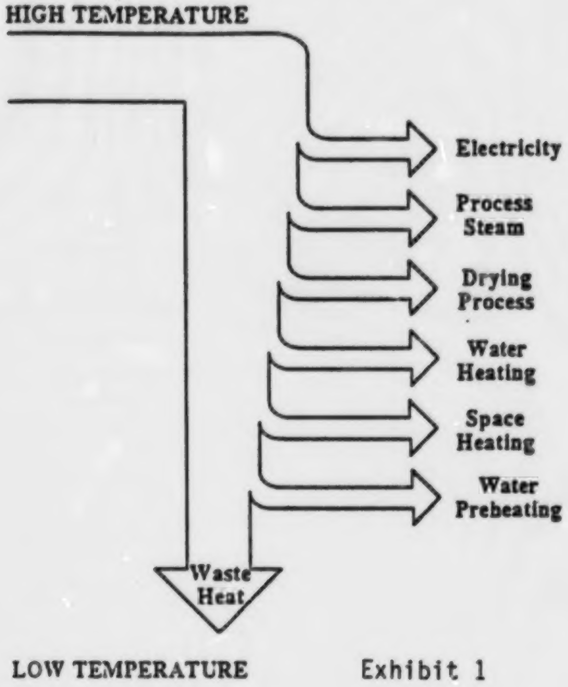

HIGH TEMPERATURE
Electricity
Process Steam
Drying Process
Water Heating
Space Heating
Water Preheating
Waste Heat
LOW TEMPERATURE

Exhibit 1

Parallel Generation

Typical Generator

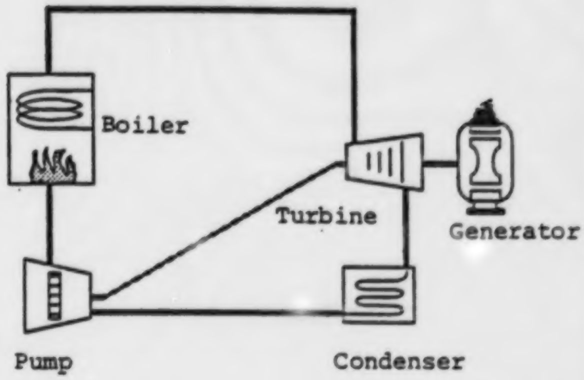

Boiler
Turbine
Generator
Pump
Condenser

Exhibit 2

Parallel Generation

Cogenerator
(topping)

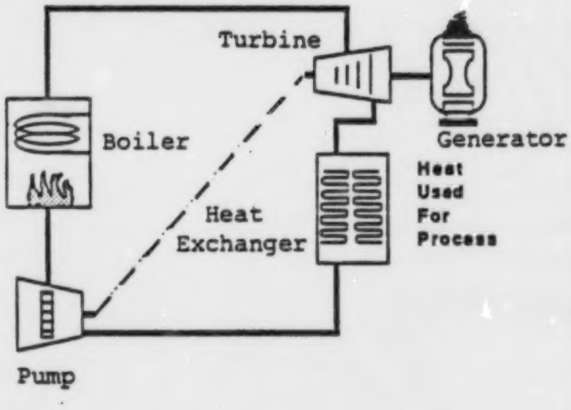

Turbine
Boiler
Generator
Heat Used For Process
Heat Exchanger
Pump

Exhibit 3

Parallel Generation

Cogenerator
(bottoming)

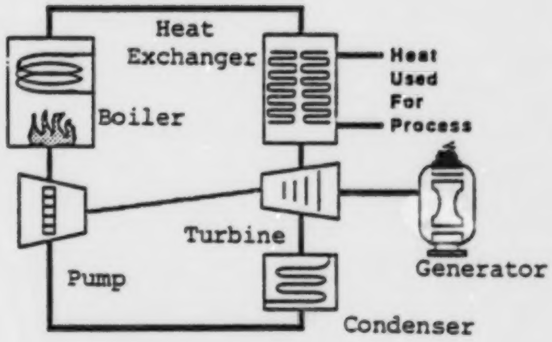

Heat Exchanger
Heat Used For Process
Boiler
Pump
Turbine
Generator
Condenser

Exhibit 4

Cogeneration System

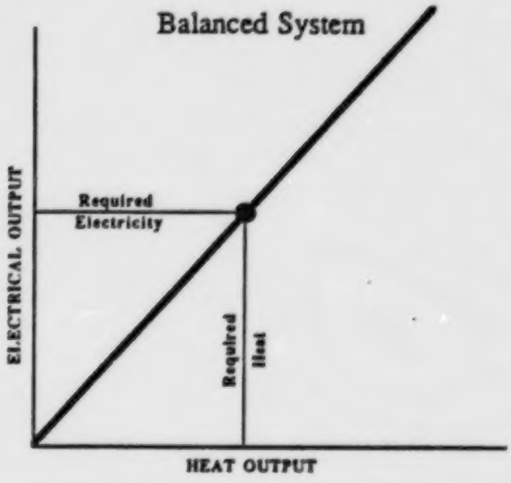

Balanced System
ELECTRICAL OUTPUT
Required Electricity
Required Heat
HEAT OUTPUT

Exhibit 5

Cogeneration System

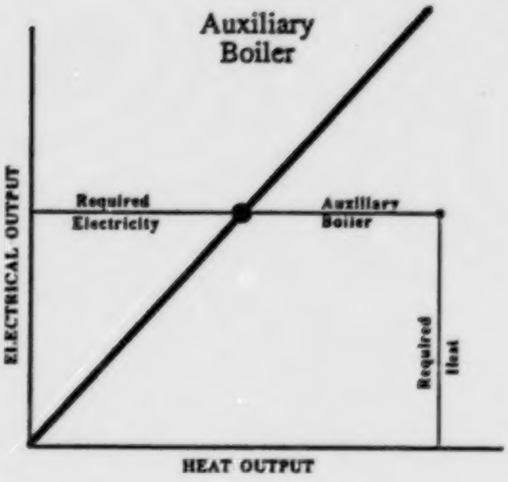

Auxiliary Boiler
ELECTRICAL OUTPUT
Required Electricity
Auxiliary Boiler
Required Heat
HEAT OUTPUT

Exhibit 6

Cogeneration System

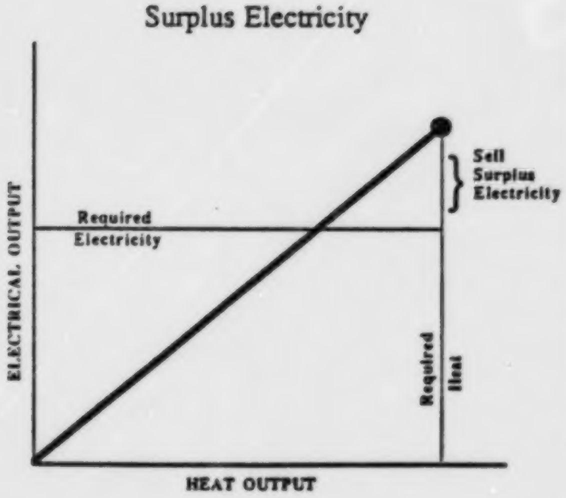

Surplus Electricity
ELECTRICAL OUTPUT
Sell Surplus Electricity
Required Electricity
Required Heat
HEAT OUTPUT

Exhibit 7

Parallel Generation

Gas Turbine

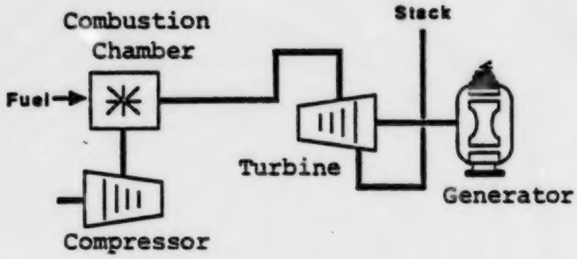

Combustion Chamber
Stack
Fuel
Turbine
Generator
Compressor

Exhibit 8

Parallel Generation

Combined Cycle

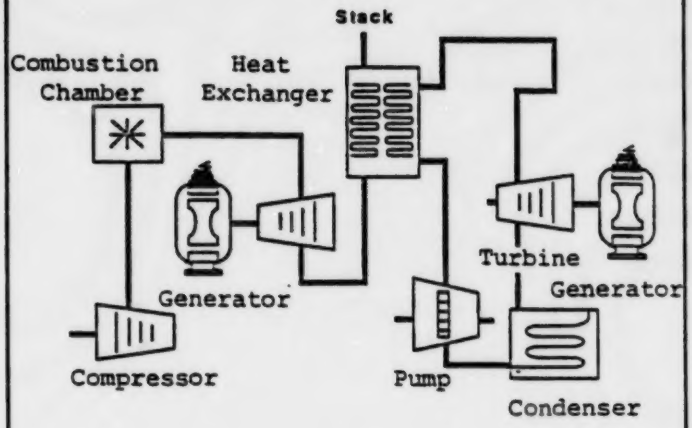
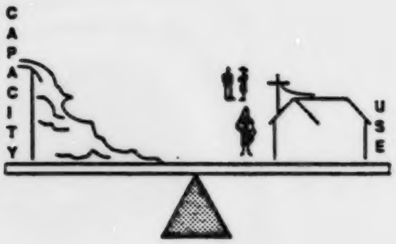

Stack
Combustion Chamber
Heat Exchanger
Generator
Turbine
Generator
Compressor
Pump
Condenser

Exhibit 9

DSM

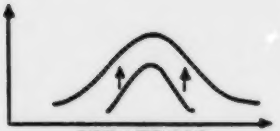

CAPACITY
USE

"Demand Side Management (DSM) is the act of matching the demand side (customer timing and level of use of energy) and the supply side (generating and transmission capacity) in both the short and long term."

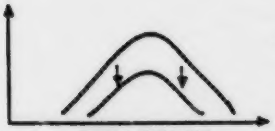
Exhibit 10

Demand Side Management

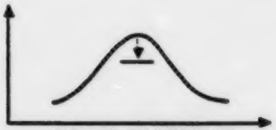
What Is It?



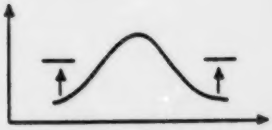
STRATEGIC
LOAD GROWTH



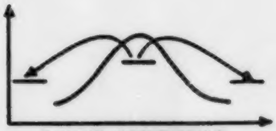
STRATEGIC
CONSERVATION



PEAK CLIPPING



VALLEY FILLING



LOAD SHIFTING

Exhibit 11

THE ROLE OF DEMAND SIDE MANAGEMENT

(EDITED TRANSCRIPTION)

JOHN SHEEHAN

Vice-President
CUSTOMER SERVICES
B. C. HYDRO

Tim Newton has explained what we mean by Demand Side Management. A big portion of Demand Side Management is conservation. Conservation came into vogue during the oil crisis of 1972. It was brought home to me very vividly then because one day I came home from work and my wife was sitting down reading. No dinner ready or anything else. That was very unusual because she would always have my dinner ready when I got home. So I did not say anything; I was a bit wiser than to make any sarcastic remarks.

She said, "Did you hear about Nixon's speech today?"

I said, "No".

She said, "Well he came on and talked about conservation because of the oil crisis. They are putting through some legislation on conservation; the message was that everyone should conserve energy - so ever since then I have been conserving my energy".

So when we talk about energy conservation we have to be careful what energy we are talking about.

It is amazing how things change. In B. C., when you mention conservation of electricity nowadays it has a negative connotation. It was very positive right through the 1970s and into the 1980s. However, our surveys now show that when you talk about energy conservation people are afraid that you are advising them to not put in that hot tub, spa pool, or additional comforts which they want. So we are using the term Demand Side Management (DSM), which is the term used commonly in North America (Exhibit 1). It is still a great mouthful, we are still searching for some more acceptable term than DSM, but we are stuck with it for the time being.

You saw this slide earlier (Exhibit 2). This is the energy we expect to save by selling the concept of DSM which will benefit both Hydro and its customers. Anything that benefits B. C. Hydro will benefit its customers. It is a huge block and we are giving it high priority. It builds up significantly to the point where it is nearly equivalent to Site C, a $3 billion plant. So the theme is to increase the efficiency of energy production and energy use (Exhibit 3). That will reduce the customer's cost of energy. As the Chairman mentioned this morning, B. C. Hydro's mission statement is to support the economic growth of British Columbia through the efficient supply of electricity. The programs we are presenting on DSM promote those items I mentioned, particularly those related to efficiency.

Now, why DSM? In the 1960s, or really prior to 1970, we optimized the supply to meet the demand (Exhibit 4). It was easy because every time we brought on a new plant the cost went down. By getting more efficiency we were decreasing costs in nominal terms. Through the 1960s Hydro introduced something like 40 different rate decreases. We started introducing rate increases in the early 1970s. Since 1970 the cost of new supply has been increasing. All of our efficient water was harnessed in the 1960s and in the 1970s we had to move further afield. Transmission costs were higher, inflation increased along with various other things, so the cost of new supply increased. Electricity was still very cheap and people were used to this great thing that could be used for more and more purposes. It increased the demand on us, and although it was cheap, the cost was increasing. Now we have a mismatch between the cost of new supply and the cost of more efficient usage. We do not want to take away anyone's right to put in a new spa pool. However, we said there are a lot of efficiencies out there that we must use.

To give you an idea of the cost of new supply, in very rough terms, Revelstoke, our latest plant, costs roughly $2¼ billion for 1800 MW which comes in at about $0.023/kW.h (Exhibit 5). Site C at the generation level, again in rough terms, is about $0.03/kW.h. The next cheapest plants are Murphy Creek and Keenleyside, but they are relatively small. The next large project is Stikine-Iskut, and remember we have spent about $13 or $14 million in feasibility studies on it, at $0.043/kW.h. Transmission cost is around $0.04/kW.h and increasing. At the distribution level we are looking at a cost of about $0.011/kW.h.

Roughly speaking, if we have to support a new resident or a new customer that comes on and demands power from us and we must use new generation to support him, we are talking about an investment of around $30,000 for each new customer. Now we are lucky enough at this point in time that we still have excess transmission capacity. But that is the kind of additional cost that should be put on each new house that is being built if B. C. Hydro must back it up with new generation. I have not taken into account line losses, and, of course, the further we go afield for the new generation the more line losses we have. Our line losses average about 7%.

As we institute DSM we will incur some costs; in other words, we will be spending money without increasing revenue for the money that is spent. Nonetheless, we will reduce additional costs and thus reduce the overall cost compared with what we would otherwise be required to charge.

Let us look at the number of fluorescent lamps in B. C., now totalling approximately 20 million (Exhibits 6 and 7). Assume they are all 40 watts. We pick that particular number because there is a program where we can replace the 40 watt lamps with a 34 watt that will give the equivalent light. We are looking at 6 watts reduction per lamp. The saving per year is 3,500 GW.h. The load reduction will be enough to serve, in total, all the electricity for 50,000 houses. A small reduction in power consumption, same light with a different efficiency. We could add another 50,000 houses without having to put in any new generation, any new transmission or any new distribution, except the distribution to the home. We are looking at a rebate of $0.25 per lamp for a cost of $5 million, an equivalent unit cost to B. C. Hydro of $0.02/kW.h. The $0.02/kW.h is only a fraction of what the new generation would cost us. That is just one example.

With DSM we want to lower electrical requirements for buildings. We know that buildings will be built. We want to encourage strategic conservation and peak clipping (Exhibit 8). B. C. Hydro has no problem with capacity on its generation side because a hydro plant is built to use almost all of the water even during high flows (Exhibit 9). The additional machines do not cost very much. It is the dams, transmission and other such things that really cost money, so we put in the additional machines and we do not have a problem with peaking capacity at the generation level. However, there could be peaking problems at the transmission or distribution levels.

With strategic load building the pattern of B. C. Hydro's product must be examined (Exhibit 10). You saw this slide earlier (Exhibit 9), but what I want to show is that B. C. Hydro has two products. With B. C. Hydro's current facilities, the current ability to produce electricity, and the water patterns and the precipitation that we had over the years back to 1940/41, we can see when water levels were above the critical water level in different years. When I say we have two products, we have firm and secondary electricity (Exhibit 10). With firm electricity you expect to have the electricity regardless of the water conditions. You are guaranteed electricity for your plants, your houses and so forth. You can see that in the years 1942/43 we could only produce 40,000 GW.h/year (Exhibit 9). Actually, we have large reservoirs, so if we are short in one year we can allow it to flow over to the next year or draw the reservoirs down. We normally talk about this as our critical period and we talk about our ability to produce on a guaranteed or on a firm basis of 42,000 GW.h/year.

In addition to firm energy there is secondary energy. There is always confusion when we talk of our surplus being exported into the United States. We are mainly exporting secondary energy. B. C. Hydro has not marketed secondary energy in Canada until very recently. Now we are marketing secondary energy under the E-Plus Program.

The E-Plus Program is trying to sell that secondary energy at home rather than export it into the United States. But you must recognize that if you buy it, you could be interrupted. If you are interrupted on secondary energy it is an energy interruption not a capacity interruption like you might have in Ontario or elsewhere. An energy interruption means we do not have enough water in our dams and it could last a long time. Our energy year or our "water year" is really a 12 month cycle, so you could be interrupted for a full 12 months. At the moment, while we are selling E-Plus, we are guaranteeing that there will not be an interruption before 1991. Thereafter, depending on how much of it we sell, the E-Plus customer could be interrupted 30% of the time over a 10 year period, but interruptions are likely to be much less than that.

On the E-Plus program in the residential sector the customer must have an ability to use wood or use some other fuel. We are promoting the use of secondary energy rather than having a house which is totally dependent on electricity (Exhibit 11). We will be promoting new building code standards, other fuels for heating, and, of course, the lighting program which was previously mentioned.

Commercial building standards have changed dramatically in recent years (Exhibit 11). I was doing some construction recently and for a particular purpose I wanted R8 insulation. I found that it was off the market. The lowest insulation you can buy is R12. Ten years ago I think half the buildings had R8 in the walls, very few of them had R12.

With the industrial programs there will be big efficiency increases in motors and drives, but there is also the lighting, and then, of course, there is our energy bus, the energy audits. We are strongly advising that engineers, who are planning new plants with high energy use, discuss the plant design with us first. Maybe there are areas where we can advise on energy use. In fact in new plants, as the Chairman mentioned this morning, we have seen there are opportunities for improving energy use in cogeneration plants, particularly at the design stage. Retrofit is not really efficient unless we see the plans for the plant construction beforehand.

With our hydro system we do not have problems with peaking on the generation level. However, there can be problems in the transmission (Exhibit 12). In terms of peak clipping on the transmission and distribution sides, there may be ways in which we can defer strengthening our system. And, of course, it depends on economics. We have an example from Fort Steele where they wanted to use more energy for irrigation. We agreed, but suggested that they use the energy in the off peak time because the additional load would require that we significantly strengthen the substation. We explained that if we could defer strengthening that substation, it would be worth quite a bit of money to us, a savings which we could share with them. All they had to do was agree not to use the pumps during the peak periods to ensure that we would not have a peaking problem during the day. Thus, with their cooperation, by using the pumps between 5:00 and 8:00 p.m., and a couple of other constraints, our engineers reassessed the situation and deferred construction for a few years which benefited everyone involved.

By knowing the customer's future needs and by examining the economics of the situation we can see if there are potential mutual benefits. As well, we are looking for ways of decreasing the demand in the diesel districts. In these districts we are selling the electricity for $0.05 and it is costing us $0.15 - $0.18. You can see there is an immediate economic payoff if we can somehow change the load pattern.

The strategic conservation program could avoid an additional load of 3,000 GW.h/year after 20 years (Exhibit 13). Now 3,000 GW.h/year is three-quarters of a Site C, which costs $3.2 billion. The estimated cost over the 20 years to achieve this conservation is $200 million. That is spending $200 million to have the customers not buy as much electricity from us. It is the reverse of normal marketing objectives.

Our new marketing manager has had to do a flip to say, "I am going to be selling, but I am going to be selling the concept of not buying from us". It is reverse thinking. It is hard for people to accept that you have spent a lot of money to sell less, but that is what we are doing. What we are really doing is spending $200 million in order to avoid spending $3 billion.

Our load forecast, imperfect as forecasting is, is illustrated here (Exhibit 14). The dashed line is our forecast without DSM. The solid line is the forecast if our program succeeds and we save those 3,000 GW.h. We expect a growth of 2.7% in the period up to 1997 and 2.9% thereafter. The difference between the two forecasts is 5% of our total load. The potential saving could be far greater because there are other opportunities.

The saving also defers the building of a Site C (Exhibit 15). We will eventually have to build it because the demand is still rising. However, this would defer the construction by one to two years. By deferring an expenditure of $3 billion for two years $300 million is saved each year in interest -- with the interest on that saved forever more. So there are tremendous incentives to have DSM work.

From the customer's viewpoint DSM reduces B. C. Hydro's revenue requirements by $700 million in the first 20 years. Over the 20 years we would reduce the consumption by 32,000 GW.h (Exhibit 16). It is building up; 3,000 GW.h in the last year and increasing. It is the equivalent to a cost of $1.2 billion over 20 years. The potential that we have identified is 8,000 GW.h/year (Exhibit 17). Some of that is quite costly, but we should be capable of getting 3,000 GW.h saving from the 8,000 GW.h available. One thing about costs is that if we are smarter we may keep changing the cost relationships. Our whole job in DSM is to balance demand and capacity (Exhibit 18).

Now, in anything that we have said here, we are not inhibiting the growth of the economy of B. C. (Exhibit 19). We are not decreasing the desire for better comforts in peoples' houses. We are not saying that they should not have those spa pools. What we are saying is, "let us supply those comforts in a smarter way". Let us supply them in a way that would be cheaper for everyone. And again we can bring it down to economics. Let us supply them in a way that would be less harmful to the environment. So we are looking for a balance between the DSM and new generation.

It is only a few years ago, back in 1982, when Hydro, was scrambling. We thought we could not meet the demand on us under any circumstances. We thought there would be pressures all over the place. Our forecasts seemed to be low compared to the historic growth of demand. The forecast in 1982 was 6.5% annual growth. We came through the 1960s with about 17% annual growth, through the 1970s with 11%, but in 1977/78 it dropped to 8%. We were going into the 1980s with a 6½% forecast and many people thought that we were too low, that we would not be able to satisfy the demand.

In 1982 we were planning on a 6½% annual growth and required $26 billion of expenditures before 1994; Site C being one, Hat Creek being another, the Iskut-Stikine being the third; $26 billion. The following year when we did the forecast and the economy was turning down, world-wide as well as here, we were looking at 5% annual growth. Our planning, instead of being for $26 billion to be spent by 1994 was $15 billion. All of that has melted away and, in fact, the total expenditure by 1994 will be something like $2.6 billion.

You know we are no better at forecasting than any of the others. If you were to ask any of the economists, particularly government economists, to project the forecast growth and the gross national product for the next 10 or 12 years you would get a tremendous variance. If you asked the chief economists of any of the banks the forecast for the next 12 months and asked them two months later you would find a tremendous variance in those as well. We were trying to look not 12 months, but 10 years ahead or 20 years ahead, and, yes we were wrong. The same as they were wrong throughout the world. Our demand for new plant dropped from $26 billion to a point where we have no need for new plant. However, we do need new transmission, strengthened substations and so forth for about $2.6 billion.

We are now trying to make sure we do not get into that trap again. More particularly, now that we have had a chance to sit back and look at how else we can satisfy the demands on us, we are convinced that through these many small programs, at the lower growth of 3% or 2.7%, we can satisfy demand by putting out money so that people will not create those demands on us that would cause us to build the plants sooner.

Just to wrap up, in the Chairman's talk this morning he said that B. C. Hydro's mission was to support the economic growth of British Columbia through the efficient supply of electricity (Exhibit 19). The emphasis is on efficient. The objective is to maximize our contribution to the economic development of the province and, as he said, to be the most efficient utility in North America. As well, we want to be recognized by our customers as a superior customer service-oriented company.

From 1962, in the rush to meet the demand put on B. C. Hydro, our emphasis was placed on being top technical experts. Even though I am from B. C. Hydro I say that a fantastic job was done, given the terrain and given the projects that we had to build. Indeed, a tremendous technical job was done, but the emphasis was always on providing a good product though not necessarily listening enough to the customer. And that is the big change that we are trying to bring about in B. C. Hydro now; to be customer oriented, to listen more to the customers, and even though we might know the best answers let us listen to the customer and if he does not want the best answer let us give him the second best because that is what he wants (Exhibit 20). And then, of course, it will depend on being a good employer.

Questions

Bill Best

The real question now is the positioning and the concept of DSM in the plan of B. C. Hydro, that it is a legitimate and, in fact, a very desirable direction to go. There still may be some questions about that. I know many people, for example, have real difficulty with a position of trying to "unsell" your product. The point is, and I think that has been pointed out, if you have a large building in downtown Vancouver that is being constructed and it needs a block of energy, if you can persuade his neighbour who is already there to supply that energy by reducing his use, you will not have any revenue loss because your revenue increases with the new customer by the same amount that has decreased for the existing one, but you do not have to build that big plant at a much higher cost. So this is a good policy and a good program if you have some load growth. If you are at a flat situation it does not work very well.

Bob Mussetter, California Energy Commission

Do you have building standards for energy efficiency that are mandatory in B. C.?

John Sheehan

Not nearly the way we would like. We are promoting the use of greater standards, an R2000 standard, for instance. And we will be, I suppose, doing a lot of publicity on the advantages of much higher standards, much higher codes. We will not, ourselves, be seeking legislation. Hopefully that would come through others. We do not want to put ourselves in the political arena on that one. We will show the advantages of these much higher standards and maybe the advantages in everyone complying with the higher standards.

Unidentified Speaker

John, there is a lot of opportunity for a lot of British Columbian entrepreneurs to supply demand side solutions and maybe some post secondary or secondary manufacturing opportunities. Is B. C. Hydro going to invest seed money or take positions in that industry?

John Sheehan

Firstly, as I said earlier, we would like to hear of any new plants that are going up and be in there in the very beginning. Some of the purposes of being there in the beginning will help us to show the architects where they can save energy.

Secondly, we might be able to identify where there can be cogeneration or where they could generate some of their own requirements.

Finally, they could even sell the electricity to us. I think Larry Bell spoke about one very bright 55 MW prospect. We have been negotiating with them for some time and we are close to putting in seed money. It is going to be hard for all customers and for the public at large to understand that we will be putting money into a plant so that they will not buy electricity from us. But that is what we will be doing.

Amory Lovins, Rocky Mountain Institute

To follow up on that, if I were a B. C. entrepreneur and wanted to make a new factory here specifically to make electricity saving widgets, that would otherwise have to be imported, would B. C. Hydro be interested in helping me do that?

John Sheehan

We would like to discuss that with you. We are and will be promoting the use of small hydro. We are buying from a rancher who is generating 400 kW right now and we have been buying from him for the last two or three years. He came forward a month ago and said "I would like to add another 600 kW, would you buy?" We said, "Sure." We are working out a deal with him right now and that is very small. So, yes, we are buying.

Bill Best

Just by way of a brief addition to that. We are very interested, for example, in energy service companies who can come in and take the tool box of incentive programs that we have and go out and use them to sell customers and finance it on the basis of a savings that the customer will realize.

John Sheehan

And the other one that I mentioned in that respect is, if they are starting to build a new industry they should see if they can use that secondary energy.

Floyd Lundstrom, B. C. Forest Products

Are you going to give us an energy standard for these energy efficient motors? And when you talk about energy efficient motors every manufacturer has a different way of measuring their efficiency and we have a hell of a time trying to work out which one is more efficient. Is B. C. Hydro going to give us some help in determining what an efficient motor is?

John Sheehan

Zak will be covering that, I think, later on in the afternoon, so I will leave that question until Zak deals with it.

Ernie Adams, Adams Electric Manufacturing

I have electric heat in my home and I want to know if I understood your advertising -- "You will give me a lower rate on my electric heating, but I must prove to you first that I have an alternate".

John Sheehan

That is correct.

Ernie Adams, Adams Electric Manufacturing

Why do you put that stipulation on it?

John Sheehan

Because otherwise when we want to cut you off in 1993 or 1994 because we may have no secondary energy you are going to come back and have more load on our firm than we would otherwise have and all we have done in the meantime is ... (interrupted).

Ernie Adams, Adams Electric Manufacturing

If I take your lower rate and know that it is interruptible it is up to me to look after myself, I do not like having my granddaddy do it.

John Sheehan

The problem is that we all have a granddaddy who listens an awful lot to people out there, particularly when it comes around election time and so forth. And if we have an election year coinciding with a year when we have low water, we are in trouble.

Bill Best

There is one other way to look at that too and that is, if we sell those two products, we sell firm energy which is better quality, higher quality, reliable and it is at a higher price; secondary energy is lower quality. The buyer and the seller have to agree up front about the deal and the only way we can sell the secondary energy is if we are sure we do not have to supply it during those low periods.

DSM

- A lower cost source of energy

- Help Hydro become more customer oriented

June 1988

Exhibit 1

RECOMMENDED RESOURCE PLAN TO MEET RANGE OF FORECAST DEMANDS

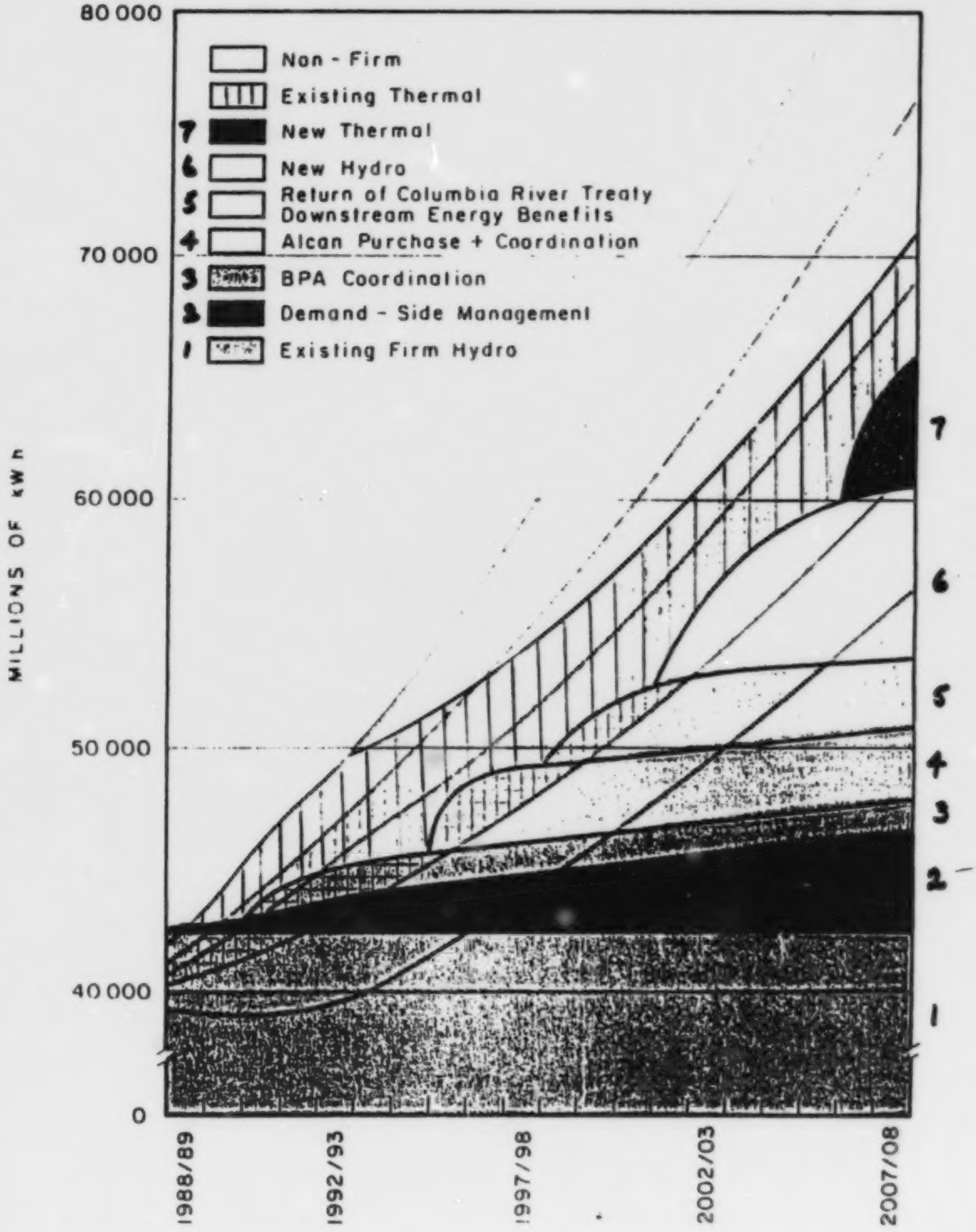


Exhibit 2

DSM

Basic Themes

- Increase efficiency of energy production and energy use

- Reduce customer cost of energy

Hydro Mission Statement

- Support the economic growth of British Columbia, through the efficient supply of electricity.

June 1988

Exhibit 3

DSM

WHY?

Historic

Utilities optimized supply to meet demand

Since 1970's

Cost of new supply increasing
Cost of energy efficient uses decreasing

Now

Mismatch between cost of new supply

and

Cost of more efficient usage

June 1988

Exhibit 4

COST OF NEW SUPPLY

Generation	
- Revelstoke	2.3¢/kW.h
- Site C	3.1¢/kW.h
- Stikine/Iskut	4.0¢/kW.h
Transportation	
- Transmission	.4¢/kW.h
- Distribution	3.0¢/kW.h
Line Losses	

June 1988

Exhibit 5

DSM

EXAMPLE

Load Reduction

Number of lamps in B.C. > 20 million (Assume all 40 Watt Lamps)	
Energy reduction per lamp	6 watts
Usage per year	3,500 hrs.
Load reduction per year (Enough to serve 50,000 houses)	420 GWh
25¢/lamp rebate	$5 million
Unit cost	≈ .2¢ kW.h

New Generation

Site C	3.5 to 4.4¢ kW.h

June 1988

Exhibit 6

DSM

EXAMPLE

Load Reduction

Number of lamps in B.C. > 20 million
(Assume all 40 Watt Lamps)

Energy reduction per lamp	6 watts
Usage per year	3,500 hrs.
Load reduction per year (Enough to serve 50,000 houses)	420 GWh
25¢/lamp rebate	$5 million
Unit cost	≈ .2¢ kW.h

Energy Purchase

Average Cost	4.3¢ kW.h

June 1988

Exhibit 7

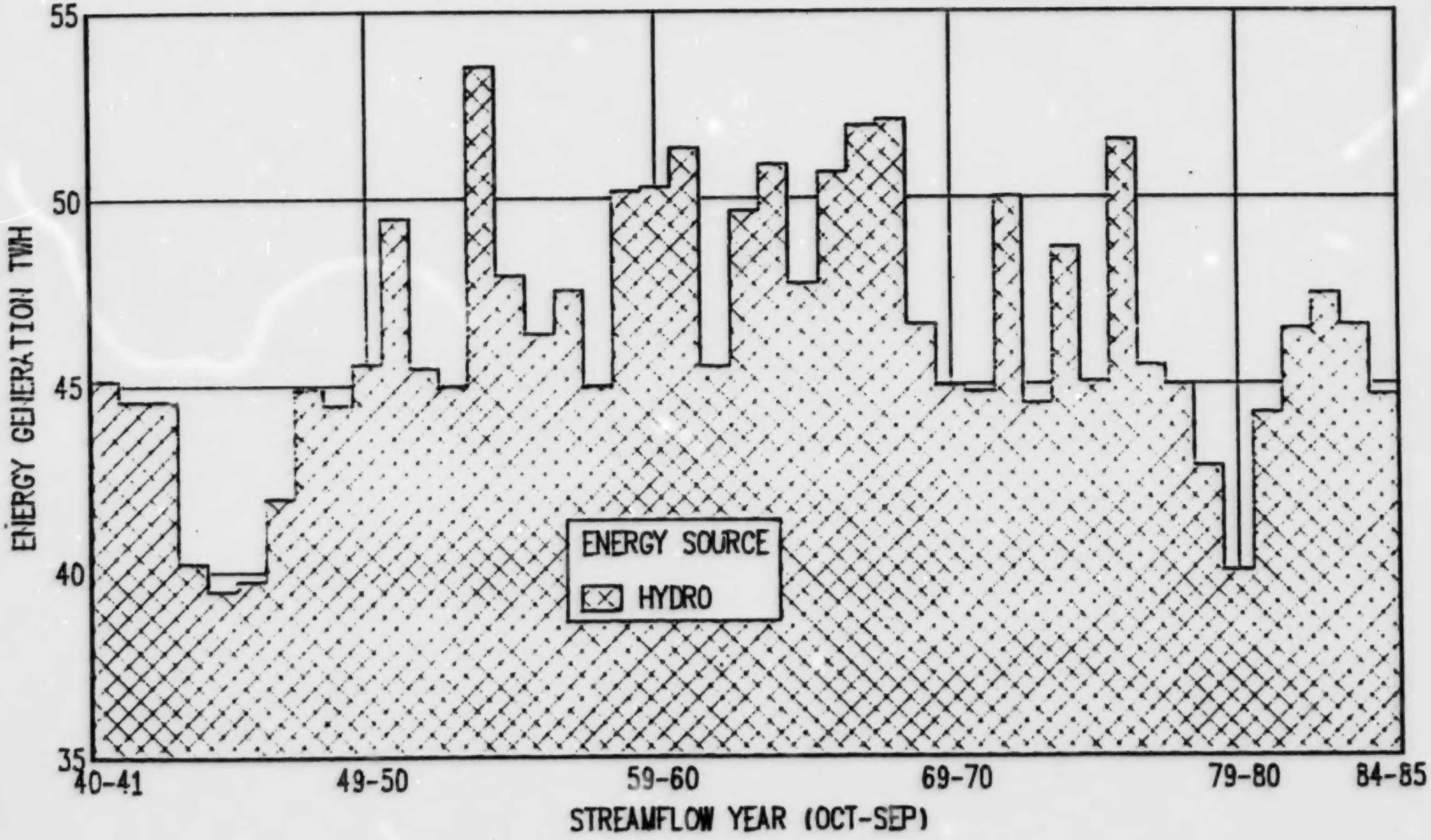
HYDRO DSM DIRECTIONS

- Strategic Load Building
- Strategic Conservation
- Peak Clipping

June 1988

Exhibit 8

HYDRO ENERGY CAPABILITY OF THE EXISTING SYSTEM FOR THE HISTORIC STREAMFLOW RECORD



Resource Planning
25 MAY 1988

Exhibit 9

DSM

STRATEGIC LOAD BUILDING

- Secondary Energy
  - System designed to meet firm load during low precipitation
  - 'Usually' have additional water (energy) available
- 'Extra' Energy Sold On Interruptible Basis
- Historically Sold To U.S. Markets
- Now Sell to B.C.

June 1988

Exhibit 10

DSM

PROPOSED STRATEGIC CONSERVATION PROGRAMS

- RESIDENTIAL SECTOR
  - Fuel Substitution
  - Building Standards
  - Appliances/Hot Water
  - Lighting

- COMMERCIAL PROGRAMS
  - Building Standards
  - Heating/Ventilation/Air Conditioning
  - Lighting

- INDUSTRIAL PROGRAMS
  - Motors and Drives
  - Lighting
  - Audit/New Plant Assessment

June 1988

Exhibit 11

DSM

PEAK CLIPPING

- Determine if proposed new electric construction can be deferred.
- Determine cost of DSM relative to proposed construction.

- Examples:
  - Fort Steele Substation
    - single large load
  - Diesel Generation Stations
    - defer upgrade

June 1988

Exhibit 12

DSM

Current Strategic Conservation Programs

Load Impact after 20 years

- 3,000 GW.h
  (3/4 of Site C capacity)

Estimated Cost Over 20 Years

- $200 million
  (Site C $3 Billion)

June 1988

Exhibit 13

B.C. Hydro
Electric Gross Requirements

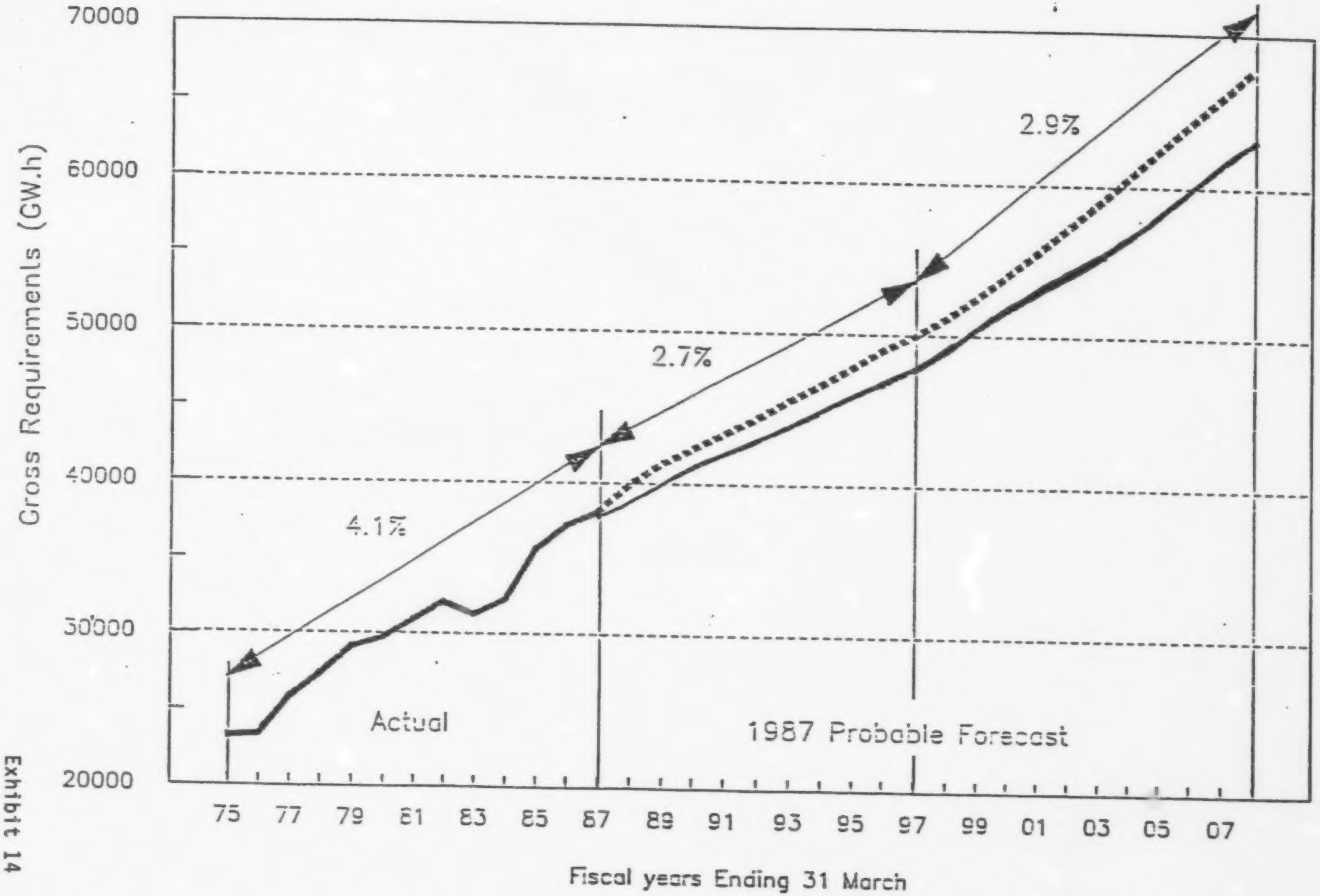


Exhibit 14

DSM

- **SYSTEM IMPACT**
  - **Defer new generation 1-2 years**
- **FINANCIAL IMPACT**
  - **Reduce revenue requirements by $700 million over 20 years**

June 1988

Exhibit 15

DSM

- **CUSTOMER IMPACT**

All Customers

Reduced Hydro Revenue Requirements

Program Participants

Reduced consumption of 32,000 GW.h over 20 years

Equivalent cost of $1.25 Billion over 20 years

June 1988

Exhibit 16

DSM

Current Plan

3,000 GW.h per year
Load Reduction

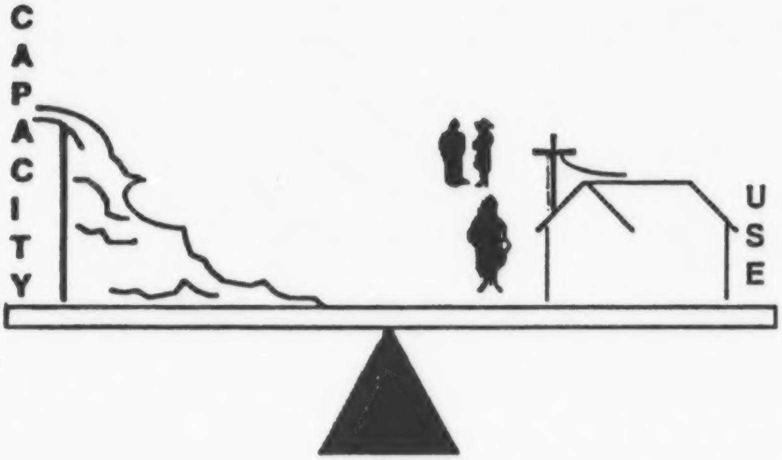
Estimated Potential

8000 GW.h per year

June 1988

Exhibit 17

DSM


CAPACITY
USE

Balance DSM and New Generation

June 1988

Exhibit 18

DSM

MISSION

To support the economic growth of British Columbia through the efficient supply of electricity.

OBJECTIVE

- To maximize our contribution to the economic development of British Columbia.
- To be the most efficient utility in North America.
- To be recognized by our customers as a superior marketing and customer service oriented company.
- To be one of the best employers in British Columbia.

June 1988

Exhibit 19

DSM

Co-operative effort

so that best use is made of available resources.

17 February 1988

Exhibit 20

THE PACIFIC NORTHWEST EXPERIENCE WITH DEMAND SIDE MANAGEMENT

(EDITED TRANSCRIPTION)

SUE HICKEY

Deputy Assistant Power Manager for Marketing
BONNEVILLE POWER ADMINISTRATION

It is a particular pleasure to be talking about something like demand side management where we have something that is a little less contentious to offer you than the inter-tie access policy discussions that we sometimes get into. I am always struck, when we get into these forums with B. C. Hydro and with British Columbia, how similar our systems are and how dissimilar they are from many other utilities. There are not many utilities that are principally hydro power based. We have pretty unique problems in being energy limited, not capacity limited. We often cannot talk to others very easily, so it is a particular pleasure to be here and I hope that we are going to get to learn from the things that you are undertaking.

I was going to start by touching the bases on demand side management. There are two particular demand side objectives where Bonneville has been involved. Principally, the conservation objective which produces an overall reduction in the average load shape. We are also very recently becoming involved in marketing. The main reason that I wanted to spend a few minutes talking about marketing is that it looks like we are doing diametrically opposed things. I wanted to point out to you the convergence that we are seeing between our conservation programs and our marketing programs.

I am going to start with conservation and give you some background, so you can understand why Bonneville got into conservation, and perhaps draw some analogies with B. C. Hydro's situation. I would like to describe to you some of the key challenges that we faced in implementing conservation programs and go over our accomplishments as well as our failures. I think we have always been pretty honest about sharing those as well. I would like to describe some of our innovative programs and talk a little bit about the future. I think you will see from the presentation that I have steered away from talking about the underlying rationale or the potential for conservation because I thought what we specifically had to offer you here today was some actual experience - things that have happened in the market place, actual accomplishments as well as the failures.

This is going to sound extremely like your own situation, but let me start us back in the late 1970s. At the time in the Northwest region we were building five nuclear plants and had others on the books. We had projected a tremendous regional deficit of power and because we are a federal entity, our friends in Washington, D. C. decided that Congress needed to come to our rescue. In coming to our rescue, in fact they did so in a fairly ironic. They passed an Act called the Pacific Northwest Electric Power Planning and Conservation Act. A revealing title in and of itself. The objective of the Act was to assure our region an adequate and efficient supply of electrical power. As the title of the Act suggests to you there were two principle themes, among other things, in the Act: one was an electric power planning system that was described in the Act and the other was a structure for acquiring conservation and renewables in that overall resource planning and acquisition system.

In addition, there were some other things in the Act that I might allude to. There was a regional power planning council created that consisted of two members from each of the four states in our region. There were some fairly bold initiatives in the area of fish and wildlife protection. One of the main thrusts of the Act is that it created a structure for treating conservation as a resource. Essentially, this Act was probably one of the first manifestations of something that is very popular in the States now called "least cost planning". The cornerstone of the Act was the cost-effectiveness test and let me outline that test for you because it really has been extremely important basis for everything we do in conservation at Bonneville.

The test basically specifies that a resource will be judged to be cost effective if it is reliable and available and, listen to these next words, to either meet or reduce load. So it is important that conservation is included in that very definition and the cost part of it specifies that that must be done at an incremental system cost which is no greater than the least cost similarly reliable and available resource. Basically that specifies that you have to be practical about this; it has got to be reliable and available and you also have to demonstrate that it is the least cost.

In 1980 when this Act was passed, Bonneville was operating under a least cost planning system and conservation was recognized in that system as a resource. We have a definition of conservation given to us in the Act. I think John has already addressed that, to some extent, B. C. Hydro is grappling with this issue. The definition is that conservation is a reduction in consumption that is a result of efficiency increases, either in production use or distribution. So you notice again, right off the bat that we are not talking about curtailment, we are not talking about behaviour changes. We are talking about technical improvements, efficiency improvements that cause a reduction in use.

One final parameter in the Act that is important is that it established a resource priority. That was particularly important because it assigned highest priority to conservation and a second priority to renewables. The Act has been an extremely robust tool for guiding Bonneville's efforts in conservation. I do not want to leave you with the impression though that this is something that we were dragged into, kicking and screaming because Congress drafted a piece of legislation. It did not take very long to discover that there was much wisdom to it; this was the least cost resource and I think that I will develop that as I go through my remarks.

A couple of other things are important just so this does not seem like it was too calm and well considered. Remember that was in 1980. In 1982 I joined Bonneville and one month later we came out with our first forecast that demonstrated that we had a sizable surplus and not a deficit at all. That threw the nuclear plants and the conservation program and the whole resource planning area topsy turvy. So many of the things I am going to talk to you about are responses to that situation as well.

One final point of background. Bonneville is a wholesaler and we sell our electricity to utilities, principally public utilities in the Northwest. That is critical as I go through and describe our programs because they are being implemented through approximately 120 - 125 utilities. We design the programs, offer them to the utilities and they implement them. There were many, many challenges as we started into the conservation area and I will outline five here that I think capture some of the principal ones in a broad brush way.

The first one was measuring and determining the availability of resources. The challenge is an obvious one here. We had a planning system that had much data on coal plants, nuclear plants, hydro facilities. How much did they cost? Where could we site them? That had been the focus of resource planning today. When you try to make conservation equivalent the first thing you need to do is develop that same level of data and integrate conservation into your models.

The problem with that was that back in 1980 there was not a lot of experience with conservation programs. At that point we decided, "Okay this is going to take us quite awhile and we are going to dedicate significant effort to coming up with that data and we better start right now to create the analysis environment for that". That took three generations of data improvement.

In the first case we were basically dealing with back-of-the-envelope best estimates, anything we could get from programs that had been run in other places. The second generation of data that we used was all based on engineering models. At about the time we were relying on that generation of data we started to get some experience with audit predictions and the amount of savings we were actually achieving. When we first started off we were wrong by a factor of two. We were getting half the savings our audit was predicting and the fault was in the audit and the engineering models rather than in what was occurring.

At that point we thought of the retrofits. We did not have a lot of confidence in the engineering models either and we have proceeded on to a third generation of data which was based on measurements, either evaluations of our own programs to measure the cost we spent and the energy we saved, or end-use metering. We have what I think is probably the largest end-use metering program certainly in our country, maybe in the world. There are over 2000 homes being metered, many commercial establishments as well as industries before they use the conservation measures and after to get a much better understanding of the actual savings.

The second major problem, which perhaps you can relate to, was demonstrating the reliability of conservation. Everyone can see a hydro facility. You can see a coal plant. You know when it is generating electricity. We had a very difficult time creating a level of confidence that you could actually plan to achieve 50 MW of conservation, list a bunch of insulation measures and some efficiency improvements in motors or some such technology and have anyone believe you that they could count on that to meet load obligations. We took this on as the main challenge in the first couple of years of the program. The way we approached it was basically to set up what I would call an extremely rigorous planning process that came out with very quantifiable objectives which we religiously measured. So for every program that we ran we did evaluations to measure what was accomplished. In many cases these evaluations were invaluable in telling us the things that we were not doing right and where the measures were not accomplishing what we thought they would. We were able to make midcourse corrections very early. I should say as a bottom line here that we are now convinced that we have pretty accurate estimates of supply and that we are able to predict, with a high degree of accuracy in the residential sector. We are getting there in the commercial sector and have quite a ways to go with the industrial sector.

Lost opportunities were also an interesting challenge. The best way I can define that to you, if you are not familiar with the term, is that basically if you are building a new structure, a new industrial facility, it is a lot less expensive and easier to build it efficiently the first time rather than coming back and retrofitting. There is also the way that you package in existing buildings. If you went into a residence and did all the conservation measures except the two most expensive, you could create a situation where it was not cost effective to come back and do those last two measures. So we put a lot of emphasis on not creating lost opportunities and hopefully addressing them as our highest priority. I will talk more later about model conservation standards and codes which I think are a very interesting program in our area.

Achieving results in the marketplace is difficult. I think the first month I was on my job I gave an economist an assignment to come up with an incentive policy -- that assignment eight years later, is not done. We were grappling with the great difficulty of causing a response in the market place. You cannot forget that that is what this resource is and we were trying to look at incentives.

Do you pay people to do things? Do you provide information? Do you provide technology? We were very aware that what we were trying to do was create an environment where decisions would be made to invest in conservation ahead of when that might have occurred otherwise. We wanted to create benefit for consumers and benefit for the utility. My own impression is that we erred on the side of throwing money at the problem. We are getting more sophisticated about that. In this area, one of the things that helped us significantly was the involvement of many people in the design of our programs. We involved the customers that we deliver the programs to, consumers that are going to be adopting or responding to the programs and manufacturers who were manufacturing whatever would be used in the program. Public interest groups also helped us immensely not to have a mistake or a failure as we released a program.

I think I have talked enough about evaluating success. I do not want to hit you too hard with that one, but a difficulty was there really. There was no accepted practice for how to evaluate quantitatively the impacts of things we do. Something was very satisfying about our approach, but it was hard to find the right technique.

I am going to give you some perspective indicating that we actually have accomplished some things. I have laid out the megawatts that we saved to date through 1987; the dollars that we have spent and some rough cost per megawatt. I will try to translate this to terms that you use here. The key points that I would make is that by the end of 1987, we had saved 185 MW. In rough terms that is about half of the 3,000 GW.h that you are calling for. So in the first six or seven years of our effort we have saved 185 MW. I think that is a sizable amount; it is also a fairly long time. Seven years is a long time. DSM is not a resource with which you say in 1988, "I think I want 300 MW", and you get it by 1989. This process requires many actions occurring in the marketplace. The other thing I point out to you is we have spent $500 million. Half a billion dollars is a sizable sum, so this is something that takes a lot of dedication of resources. It is the least cost resource, we are convinced of that but that does not mean it is free.

Finally, one interesting thing is the variation in cost per megawatt by sector. Something that is important for you to understand is a point that I mentioned earlier. The variance is more due to the way Bonneville ran the programs than the cost of the measures. We make our decisions about which programs to run based on the full cost of measures and then we make an independent decision. So that is telling us about cost effectiveness. Then we make an independent decision about how we get the marketplace to respond. In the residential sector we were paying close to 90% of the cost of the measures in our retrofit program. We were starting with a deficit looming and paying what we thought were the incentives that were required to make things happen rapidly. In the commercial and industrial sector not only are the measures somewhat less expensive, we did not use that same approach. We felt we had the breathing room to go a little more slowly, so we tried to use information, technical assistance, those kinds of things much more heavily than the incentives we used in the residential sector.

We also have a program that is called a conservation modernization program. This program is for the aluminum smelters in our region. The thing that I think is important for you to understand is we estimate that the program will save on the order of 200 MW by the 1990 period. So there is another significant block of savings that we just treat somewhat differently than these.

I am not going to go over each one of these programs, never fear. I basically wanted to just show this to you though because I think that you are dealing with a proposal from B. C. Hydro that reads like the Who's Who in energy conservation. Many of the things you are doing we have tried. Some of the things you are doing we have not tried and I am going to be interested to see how they work out. I just wanted to show you that we have been running programs in every sector and we have been running programs for new activity as well as retrofit.

Probably the backbone of our program has been residential weatherization. We have very high penetration of electric space heat in the Pacific Northwest, something like 70-75% of homes have electric space heat in the Northwest. Those have probably been the two programs that contributed the most savings. Our focus now is basically on that block of programs in the new area, and something that I would like to spend a few minutes describing to you is the fact that I mentioned a Regional Power Planning Council was created by this Power Act.

This Power Planning Council was given the authority to pass model conservation standards, which they have done in the residential and commercial sectors. And the way that we have gone about trying to achieve those standards is basically coming up with a strategy that codes are going to be the best way to get new buildings, new commercial buildings and residential buildings, built to those standards. The best way to get codes is to get building practice improved so that you do not have a lot of builder opposition to those codes. So we have undertaken a significant program in terms of dollars, regional involvement, staff time in the area of particularly new residences and some interesting programs in the area of commercial buildings. I think we have an advantage there that you do not have, but I am not sure it will turn out that way because I do not know if we will ever use it and that is called a surcharge. Basically this Act also provides Bonneville with the ability to surcharge utilities who do not comply with these model conservation standards when such a surcharge is recommended by the Council.

So it is a wonderful club, but the political outcry about use of that club is so significant it is not clear how effective it will be. In the last two or three years, we are getting into the commercial sector and the industrial sector in any comprehensive way. So we will be in lock step marching through this, but those are the sectors that, as you will see, we are emphasizing the future.

I wanted to give you just a slightly different twist on accomplishments -- this is the more human side of accomplishments. In the residential sector, out of some 120 utilities that could participate in our programs, 110 do and we estimate that some 200,000 residential consumers in the region have taken part in residential programs. There have been 5,000 commercial buildings that we have retrofitted or assisted with the design of a new building. Industrial then is one step further down. There are 20 utilities that are participating with us, and only 40 end-users.

I am going to spend a little time here now giving you a snapshot of some of the programs that we have run. I do this as context for the programs that you are considering running here because I think you will see that many of the concepts that you are looking at we have tried, made some mistakes, made a little better. Perhaps you can benefit from that.

The Hood River conservation project is probably our largest experimental pilot project. It was basically an experiment in the community of Hood River, Oregon. The experiment was designed to test several things. First and foremost was cost effectiveness. We went in with some aggressive measures that were not included in our normal weatherization program and asked ourselves the question, "Okay, they do not make it through our models, but can we retrofit a whole community by using aggressive measures and find that their savings are significant enough to be cost effective".

We also felt it would be important to test penetration rates. That is a hard to do when you are planning these programs. We must determine how long it takes to develop a certain amount of this resource. The regional power planning council was telling us we ought to be able to achieve 85% penetration. That means participation by 85% of all home owners in the area with electric space heat -- we were going to weatherize their homes under our program. We felt that this was somewhat optimistic. It was a three year experiment, so we were also trying to test how quickly we could get that penetration level.

Essentially we learned extremely positive things about penetration and timing. The penetration levels were very, very high, approaching the 85%. We also learned some important things about cost effectiveness. Some of the measures proved out, some of them did not. In addition, we learned some things about indoor air quality, which is another issue that you will face. So we view this to be an extremely important pilot program that actually has attracted international interest, focussed on existing residential customers.

The next two programs are commercial programs, both focussed on new commercial customers. The Energy Edge program was one of these. It was much more difficult to develop commercial model conservation standards than it was to develop them for customers. So the regional council set a commercial standard. At the same time they directed Bonneville to run a research program that would identify opportunities for going 30% beyond the standard that they set. And the Energy Edge program was our response to that. Essentially it was a program in which buildings were designed, design assistance was provided and design awards were given.

The buildings were constructed, or are being constructed right now. End-use metering was done to understand if the designs performed as specified, how much the assistance helped, and that sort of thing. We are still not in the final stages, but it has been an extremely important program for us in the commercial sector.

Energy Smart is the follow-on program from Energy Edge. The interesting thing about this program is that it is both a marketing program and a conservation program. That is definitely not a deficiency. We are interested in efficient new commercial buildings, but we also think that this is an important approach to marketing the advantages of electricity, efficiencies in lighting, efficiencies in building operation and so it also is a very important marketing program for our customers. This is a program that we are just starting.

The conservation modernization program is the program that I mentioned for aluminum smelters and has the name ConMod because we could not decide what the objective was. We were extremely interested in conservation. The aluminum smelters are one of the largest blocks for conservation on our system, and we thought we could achieve it very rapidly. On the other hand, we also knew that if we made some investment in efficiency in those plants, it would attract similar investment on the part of the smelters. Having attracted that much capital investment into modernizing those facilities we will probably end up with more stable loads on our system; those facilities would be more efficient, but they would probably be up and running more often.

We basically paid 5 mils per kilowatt hour which will be about a $100 million investment by 1991. We will end up with approximately 200 MW of savings and we anticipate at this point that the smelters will have invested three to four times our investment in order to actually make the efficiency improvements. It is hard to tell how this program is working at this point. I do not know if you track aluminum prices, but they are up from levels of $0.50 a pound to $1.25 a pound, so we are not claiming that this program has stabilized those loads at the high level. We think it has more to do with prices.

The Energy Savings program is an industrial program. The industrial sector has been particularly difficult for us. In many other sectors Bonneville designed a centralized program approach. Our utilities picked up the approach and ran a centralized program. That is difficult in the industrial sector, and, in fact, in this Conservation Modernization program we even ran into some very sticky proprietary issues where the smelters did not want the other smelter to know what sort of efficiency improvement they could make. So our approach in the industrial sector is basically an individual solicitation approach. We suggest that there are a certain dollars available, a certain incentive level will be paid and ask for proposals. We recently sent out a solicitation and we have more proposals than we can fund. It is about a $2.5 million per year program.

The next two programs, Residential Conservation Demonstration Program (RCDP) and the Code Support Program are both support for residential codes. The RCDP demonstrates technology in single-family homes, multi-family homes, and now we are expanding it to mobile homes. We demonstrate the cost effectiveness of measures and certain technical approaches to achieving model conservation standards. It helps us in debating with builders and the others about which measures actually perform when they are in a home.

The final point I have already made about load data collection. Perhaps this is something we can share with you. We have not effectively analyzed all the data that we have, but we do have an extremely broad end use metering program.

Let me summarize the lessons we have learned. While the bulk of our savings in the 1987 period is from residential and this will continue in the 1995 period, we are anticipating by the year 2000 that our industrial savings will have almost caught the residential and the commercial savings will have exceeded it. This is a target of some 600 MW by the year 2000 so we are going for an increment of conservation savings similar to B. C. Hydro's between now and the year 2000. We are actually focussing on the same sectors, commercial and industrial.

One other thing I should mention. I have spent a lot of time talking about our model conservation standards in commercial and residential. Those savings are not reflected on this chart and it is just an anomaly resulting from the way we treat them. They are treated as changes to our load forecast. That is confusing when comparing the investment we make to the savings that we achieve. It is not a particularly difficult issue in the 1987 period, the savings are not that large, but by the time we get to the year 2000 we are anticipating savings on the order of 300 MW from new residences, so by that time it is a significant omission.

I want to re-emphasize a few points and summarize them and hopefully crystalize some of your thinking. One of the most important things that we think we have done or tried to do, made some mistakes on and got better at, is developing an infrastructure to achieve conservation. There are two principal things that I want to talk about in that area. The first one is design of programs and the second one is stability of programs.

In the design area I mentioned earlier that we found it tremendously beneficial to involve others in design. In several cases we actually used what marketers call "focus groups". Whenever we can afford the time we actually do market tests of things. This method always pays off because we are finding less and less frequently that we are offering a program that our customers do not want to run and consumers do not want to pick up in its current form. We have probably spent significant time offering programs that were not well targetted or designed for the marketplace.

In addition, as a part of that design knowledge, I think we are moving more and more toward flexible programs. As we started we were very concerned about reliability. One of the ways that we focussed on reliability was control, centralized design programs and measuring every piece of the program. As we learn more about different sectors and end uses, and begin to see the dimension of these programs for our customers, we are relaxing that a little bit, and seeing that each of our utility customers that delivers these programs is a little bit different. Some flexibility in the design of the programs for those customers is a benefit to them and because it is a benefit to them, it increases the success of our programs.

The second point I would emphasize in this area is stability. When we discovered that we in fact had a surplus and not a deficit, our first inclination was to just cut the programs way back and decide that we were going to get out of the conservation area. We did not want to do that because we felt it was an important commitment. We were up on the learning curve and we wanted to continue the effort. However, we probably did go too far in trimming the programs back and, again, emphasizing that this is a resource that comes from the marketplace and from responses in the marketplace, it is a very difficult thing to initiate. It is hard to send mixed signals, conservation is important, no it is not important, oops it is important again, no never mind, it is not important. That does not really help you develop a stable base for running your programs. So I think we have learned many lessons in that area and I would urge you to learn from our mistakes.

Another area where we significantly improved is in successfully integrating conservation into our planning. In our modelling environment, our analysis environment, we have dedicated a lot of time to ensuring there is a connection between our load forecasts and our conservation supply curves. The models that we use fully incorporate the advantages of conservation equitably with other resources. In addition we are continually evaluating our accomplishments. Currently in the commercial sector we are finding the same thing we found in residential. The audits that you do of commercial buildings will not tell you the potential. There is a lot of work to do in metering and evaluation of measures as they are initiated in order to understand how they perform.

Finally, to summarize the opportunity areas as we see them, I would first emphasize new structures. That is the cornerstone of all of our conservation programs. That is the lost opportunity that I referred to at first. We feel that even if we do nothing else we are going to be involved with new structures, because if we are not doing that we are creating lost opportunities. The supply curves tell us that our greatest potential is in the commercial and industrial areas. That is why you see our emphasis changing in that direction in the future.

I am going to move on to marketing now. As I mentioned to you we had a surplus. The biggest issue for us actually emerged about two or three years ago and that was revenue volatility. Basically we have very volatile revenues for two reasons. A large block of our revenues, 40% - 50% depending on the year, comes from California sales of surplus firm and non-firm as do a large percentage of your revenues when we let you make the sales. Another large block of our sales is to the aluminum companies. When the aluminum companies and the oil and gas companies cycle down it has a tremendous impact on our revenues and 1986 was one of those years when the aluminum prices were in the 50 cent range. The oil and gas prices in California went from a level where we were selling at 28 mills six months before to a level where we were selling at 14 and 15 mills. So we had a tremendous impact on our revenues at that point. The line that says California deficits is really a misnomer, I am referring there to the fact that all of a sudden when you were making 28 mill sales you are making 14 mill sales, and as you can all imagine our customers said "Hey, wait a minute, we are paying a standard rate of 22 mills to you, we would like to use some of that 14 mill power. Why are you shipping it all down to California?". There was a clear emphasis to get into some marketing in the region, and that was basically the driver for our interest in marketing. We had two objectives. One was to stabilize our loads and revenues, and the other was to provide a customer service to our Northwest utilities.

A couple of risks actually framed our entire program. The first one was that rather than correct the volatility of our revenues we could make it worse, and the way we could do that, you have already alluded to this morning. If we were not sure that we were making an incremental sale, then basically all we would be doing would be discounting a sale that we would have made at full price. So you would be providing an advantage to the customer. If an industrial customer convinced you that they were going to bring up some idle capacity, but actually they would have brought it up anyway, you would basically be giving that customer a discount and decreasing the revenues for the whole system and disadvantaging the rest of your customers. We were very concerned about that, perhaps overly concerned.

The second key concern was the need to stabilize our revenues in the near term while not advancing the need for new resources by building long-term load. Otherwise you would be creating a need to spend significant dollars on resource acquisition in order to meet future loads. So we wanted to find a way that we could get our revenues up in the near term with short-term loads and then have the loads miraculously disappear when we needed to build resources. And I will show you how we did that.

The final thing we were concerned about was customer equity and competition. We did not want to create a situation where we were giving the discount to one industrial customer in one service area and a competitor of theirs could not get the same discount in another service area. So these were the three main risks we were worried about.

The first thing we did, but will not repeat was called the Surplus Power Block Sale. Basically we said, "Okay, we have got a 50 MW block of power, we will offer it to any and all comers for incremental load. You have to demonstrate to us that it is an incremental load, and it is only available for nine months". The price was an average of 15 mills and the power was only available for nine months. We sold that 50 MW and obtained $4 million worth of revenue. We have still got significant questions about whether or not that was incremental revenue or what we might otherwise have achieved. In fact, it was not even designed to create incremental revenue over the California market, it was designed to be equivalent with the sales we were making there.

Simultaneously we were developing a set of long-term programs we called the Partnership Programs which focussed on the industrial sector and we are pleased with that. This might be an important way for us to advance efficiency objectives in the industrial sector, even when our conservation budgets and spending are level because we are in this surplus condition.

Let me discuss two of these programs. The Conservation Modernization program indexes Bonneville's price to the aluminum smelters to the price of aluminum. Essentially, if the price goes over a certain level then we charge them more, if it goes below a certain level we charge them less. We did that in order to stabilize our revenues. We thought it would keep them up and operating and it turns out that this class of customers is probably the only large class of customers on our system. That we are providing them a discount is an advantage to all the rest of our customers, if we keep them up and operating.

The second program I would like to spend some time on is "Electric Ventures". With this new industrial program we do not offer a rate discount, but rate stability to new industries. Rate stability certainly is not going to attract an industrial customer. There are many other reasons why they are going to be locating where they are locating. What we are hoping to do with that stability is make a trade. We are interested in some of the other load shape objectives. So we are saying in the program, we will offer you stability for five to seven years. In exchange for that, we want state of the art efficiency, interruptibility, perhaps very high load factors and/or nighttime loads. This program is our entry into the whole realm of demand side management, and it shows we are trying to link efficiency and marketing and we are getting a good reception with this program, although it is only operating in a pilot mode at this time.

We are seeing that the objectives between the marketing programs and the efficiency programs are converging. Our folks in the field and our customers ask us, "Why are you guys doing conservation and marketing at the same time, those things are diametrically opposed?" It has become almost humorous because as we get into designing these programs and thinking about our objectives it has almost gotten to the point where that seems an absurd question to us because they seem so complimentary.

Another point that I want to emphasize is that both of these programs get us close to our customers and we are all realizing how important that is in a competitive environment -- understanding what your customers value. My sense of where we are going from here is that we are going to be looking, as you appear to be, at many more objectives. I want to end with this, our office slogan. "Best resource value for our customers". I just wanted to close with the observation to you that we are convinced that efficiency is the best resource value for our customers.

LUNCHEON ADDRESS

(EDITED TRANSCRIPTION)

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I will begin with a confession. For much of the last decade I have been meddling, uninvited, in the affairs of B. C. Hydro. Now at last I have a chance to do it face to face. I am honored, disarmed somewhat, but not speechless.

The history of the relationship between North American utilities and environmental groups has often been rocky. That is because those of you in the utility sector are so important. It is a tribute to the enormous stature of utilities as engines of economic and environmental change that environmental groups pay so much attention to them. And when I make my occasional forays into teaching, I draw many students with environmental interests, and I tell them that among the careers that will give them the opportunity to do the most good are those in the electric utility sector. In short I spend a fair amount of my time trying to train my hosts' replacements.

But if I have great expectations for their eventual successors my aspirations for B. C. Hydro's current management are equally high. I want to share those aspirations with all of you by beginning the process of putting the relationship between B. C. Hydro and the environmental community on a new and much better footing. My effort will be to take the theme of this conference and put it squarely into the context that has divided us most sharply in the past: namely, provincial policies for exporting electricity. In what follows I may from time to time forget to say demand side management and say conservation instead; do not be alarmed -- we are talking about the same thing.

I want to commend B. C. Hydro for the leadership role it has taken in Canada in recognizing the role of conservation and demand side management as a resource, to be evaluated on equal terms with new generators, to be pursued where less expensive and less environmentally costly. I do not have to, in this audience, do something that in many other parts of the North American utility sector is an absolute prerequisite. That is to go through the first principles of why it is that a kilowatt hour preserved from waste really is functionally indistinguishable from a kilowatt hour generated at a new power plant, and why pursuing either can make sense on its own terms in an overall integrated resource planning policy.

The pattern over the past few years in terms of export policy and the problems between environmental groups and Hydro is a pattern that has not been continued in recent months -- I want to emphasize that, I am talking now largely about history. Nonetheless, I think it is a recurring theme and it certainly is a theme that is being repeated throughout Canada.

A B. C. Hydro representative would arrive in California and offer its utilities the prospect of long term contracts for large quantities of power that would be created by construction, ahead of schedule, of a new B. C. Hydro powered dam. Lately, the list of utilities visited has included some in the Pacific Northwest. What has happened over and over again, in this relatively brief span of recent history, is that the utilities at the buying end react with interest to the B. C. Hydro proposal, only to be icily informed by the Bonneville Power Administration in Oregon that it has no interest in providing an assured long term transmission path for transactions that would compete with Bonneville's own sales. All of the parties, the potential buyers and the potential sellers, then march off to the offices of their respective politicians, angry cries of outrage resound on both sides of the international border, and no one makes progress toward mutually beneficial long term power transfers.

Throughout most of this debate, British Columbia has operated at a disadvantage. Your problem is that you have been arriving in California -- or worse still, in Los Angeles -- and saying, in effect, "Pay us to dam a river for you".

This produces an all together predictable reaction from environmental groups on both sides of the border for whom California's willingness to export its environmental costs is the stuff of legend; legend that happens to be true. At the same time the linkage between the proposed Canadian sale and major power plant construction ignites a series of U. S. legal requirements which are binding on any U. S. government agency that would potentially be involved in the sale. Since BPA would have to have some involvement in any transfer of B. C. power to California and since BPA is a government agency, the formula that you have traditionally adopted for proposed long term sales absolutely guarantees extensive environmental review by a U. S. government agency with no incentive whatever to come to a swift and favourable conclusion. Your formula also has insured that U. S. environmental groups and their political allies are arrayed against you on these issues.

I want to propose a way that you can set about changing all of that without abandoning an electricity export policy for this province. I hope the proposal will provide you with some additional insights into the merits of the demand side options that we are addressing today. I want to tell you why I think you should be inviting California and other power buyers from outside the province to pay for your demand side management, rather than for your new dams or your new thermal power plants, to the mutual benefit of all concerned.

In making my case, I want to begin with a cold-hearted competitive orientation to the electricity markets of the 1990s in which you will be operating. I ask the question, where is the province's greatest potential competitive advantage? Some will say that it is in new hydro power, but most of the cheap sites have been taken and I note that Hydro's resource plan now indicates that thermal power may actually be cheaper than most new dams. The one thing Hydro's planners and all of us can say for sure is that either alternative, either new hydro or new thermal, is going to cost substantially more than the existing resource base, which is one of the great heritages of this province.

It is not self-evident that you are going to be able to do well on the export markets by building either new thermal or new hydro, priced at about the cost of new thermal -- this is what resource plans indicate is largely out there. The best illustration I can give is what happened the last time the State of California, the largest potential buyer, had an auction in which the state's utilities set a price at the cost of new thermal plants and invited people to bid. Commissioner Mussetter from California is here today and will tell you this story in great and tragic detail in short order. 1,500 offers roared in for 22,000 MW of power -- far more than California could use. California ended up, at these thermal prices, soliciting more bids than they knew what to do with. Commissioner Mussetter is going to tell you that he has no intention of ever letting California pay that much again. He is convinced, and he is right, that California has an abundance of options for the foreseeable future at prices well below the cost of new thermal.

This means that if you want to succeed on export markets you had better not be offering your product at the cost of new thermal. Let me suggest that your primary competitive advantage lies on the demand side of the electricity meter. This results from an irony any good environmentalist is going to find positively irresistible. The United States of America is the second most energy intensive and electricity intensive of the major industrial nations. Its most electricity intensive province is the Pacific Northwest, immediately to the south. To my knowledge the only major nation more profligate from an energy perspective is the one in which I have the honor to stand now. It is in the western-most provinces that Canada is racking up its most rapid growth in electricity consumption.

All this is often said by environmentalists in a very accusatory and rather moralistic way, which is intolerable to audiences like this one. But I urge you to consider what I have just said in the nature of a business opportunity. It is precisely where electricity prices have historically been lowest, where electricity intensities are highest, that the largest untapped opportunities for inexpensive conservation are going to be found. As an environmentalist I should resent this bitterly -- it sounds entirely too much like profiting from past gluttony. But the fact is that I stand now in the capital of what ought to be the Saudi Arabia of energy conservation. Under the right export policy you could get California to pay for installing conservation in Canadian homes and businesses.

Let me flesh out the vision briefly. The notion is that you do not sell Los Angeles or Bellevue a chunk of power represented by the accelerated construction of say Peace Site C which represents 4,700 GW.h. Instead you identify 4,700 GW.h in untapped conservation opportunities at lower cost than Peace Site C and you get Los Angeles to pay for exploiting them. If you can get away with charging Site C prices for the less expensive conservation, I for one will not stand in your way. But in contemplating that prospect, a couple of practical questions have to be asked and answered.

The first is does the province has 4,700 GW.h of untapped conservation? If you look at the current resource plan the answer appears to be no. B. C. Hydro to date has identified only 3,000 GW.h of reliably exploitable conservation over the next 20 years. That is the current size of the resource as estimated by the utility. I think the staff of B. C. Hydro would agree with me that it is only the first cut in a number that I think, over the course of these two days you will end up convinced, is going to be a great deal higher than 3,000 GW.h. Let me give you a couple of general reasons why I believe so and leave the real task of convincing you to Amory Lovins. He will do an extraordinary job.

This 3,000 GW.h represents about 4% of consumption anticipated for the next 20 years. The forecast by B. C. Hydro is about 68,000 - 70,000 GW.h so that 3,000 GW.h conservation resource is only about 4% of anticipated consumption. I am absolutely confident, and I think Hydro would agree that you are going to be able to do a great deal better than that. Even the U. S. Pacific Northwest, which has a long way to go in identifying its own conservation opportunities, has set higher targets for itself for 20 years. Under forecasts comparable to the one that I have just referred to for B. C. Hydro, the Pacific Northwest regional target is 14%, more than three times the target B. C. Hydro has set for itself.

Mr. Lovins will spend time this afternoon trying to convince you that you ought to be setting the number at 50% or more. His first five minutes will be spent denouncing me for having used 50% which he will then tell you is grotesquely conservative and ought to be 80% to 90%. If savings fractions anywhere close to that are possible, and you can identify that in advance of other utilities around North America who are your competitors, and you can exploit those savings, you have an extraordinary business opportunity. I will leave Amory Lovins the task of trotting out the hardware that will help to convince you that you have got the resource.

The next question is how do you sell conservation to California or the Northwest or anyone else? Obviously, the conservation measures do not produce electricity themselves . What they do, instead, is displace electricity that would have been consumed by inefficient homes and businesses. Let me put myself in the position of the California buyer for a moment -- a role to which I am sure I was intended from birth. The California buyer is not interested in buying a power plant from B. C. Hydro. What the California utility buyer really wants is to purchase a chunk of electricity undifferentiated as to source, backed by the system, the management, the reliability of B. C. Hydro. That is the kind of sale that conservation investment allows you to do. You are not selling a power plant, you are selling California or the Northwest a chunk of power freed up by efficiency investments that the buyer pays for. You are using power that would have been wasted in the province, you are making it available to others and in return you are getting an invigorated commercial, residential and industrial infrastructure.

There are two major benefits of such a policy that really help to dramatize why it is so important to do demand side management purely from a domestic perspective, never mind the export market, so that there are interesting sources of capital. Two things that demand side management can do have not been emphasized enough yet. The first is the role they can play in reducing your utility's uncertainty about the future needs of its system, and the second is the resources that it must acquire to meet those needs.

If you look at B. C. Hydro's current resource plan you will find that it, like any utility's resource plan, is obsessed with uncertainty about the future. The B. C. Hydro forecast like any good forecast, looks like a set of jaws. There is a high case and a low case, both equally plausible, with an enormous range in between that steadily widens as the jaws open out into the future. By the time you get to year 2007 there is 30,000 GW.h of uncertainty in the B. C. Hydro forecast, a quantity of power equivalent to three-quarters of current consumption or six Site C's. The effort to reduce that uncertainty is enormously costly, in terms of hedging against the future, in terms of building capacity and buying resources for unlikely but possible events. The benefits of being able to close those jaws of uncertainty ought to be part of why all of you are enthusiastic about the prospects of demand side management.

In two vital ways conservation allows the utility to attack those jaws of uncertainty. First, the feature of this conservation resource that distinguishes it from generators is that you can view it as an accordion-like resource that expands and contracts with need. As the Province's economic growth accelerates, as new homes and businesses and population grow more rapidly than anticipated, conservation opportunities grow more rapidly than anticipated, because there are more new homes and businesses and industries to install efficiency measures in. Correspondingly, if growth is less rapid than anticipated you have a reduction -- a contraction in the number of uses of power to which conservation applications can be put. Thus, you have a contraction in the conservation resource that exactly tracks the level of need for it. So think about conservation as a resource that expands and contracts in phase with the system's needs and requirements. Recall that unlike conservation, power plant construction does not expand and contract with provincial needs. That is one aspect in which conservation helps you take on uncertainty in a way that power plants cannot help you with.

Second is the way that effective conservation policy reaches out and catches most of the uses of power that are coming on the system, so that you have policies in place to make sure most of your new houses, new appliances and new commercial floor space are as efficient as life-cycle costs justify. If you have policies in place to do that, then the damage associated with errors in the forecast are less intimidating and less dangerous.

To explain, B. C. Hydro's forecasters are no more infallible than the rest of us. They do not know exactly how many new refrigerators there will be, they do not and cannot know how many new feet of commercial floor space there will be. However, the consequences of error are less if every one of the new feet of commercial floor space, every one of the new appliances is highly efficient as a result of policies in place and known in advance. You have far less impact of error than if the new feet of commercial floor space and the new appliances are relatively inefficient using more power, hitting the forecast harder in terms of their actual impact. In those two respects then, in its capacity to expand and contract with need and in its capacity to reduce uncertainty about future loads, conservation has some unique advantages either viewed from an export perspective, or viewed simply from the perspective of domestic policy.

The other significant feature of this policy has been part of Canadian energy development since its inception. How many times have we heard about the extraordinary economic development benefits or the job creation benefits associated with the next new dam in whatever province one happens to be speaking of? How often, however, have we heard, and should not we be hearing more, about the potential economic benefit associated with an export policy that, instead of developing resources in remote locations for a period of five to seven years with a large temporary work force, disperses the investment throughout the industrial, commercial and residential sectors of the province and buys efficiency improvements that, far from flowering and then dying after a period of a decade or less, are in productive application for half a century or more. Which is the better, more enduring and more resilient economic development strategy? I hope that is a question increasingly asked. I am confident about the answer.

Finally, a demand side management orientation to export policy, the selling of conservation rather than dams, puts you in a much more compelling political position in both Canada and the United States. I do not think anyone here doubts the significance of this over the long haul, looking at the kind of struggles that you have had in the past to get over the kind of barriers that have been put before you. The Sierra Club of Western Canada and the Sierra Club of the United States alike have reflexively and inflexibly opposed long term Canadian firm power transfers for as long as I can remember. I am delighted and intrigued at the prospect of taking before them the prospect of a firm transfer that is not backed by the construction of new generating facilities but is backed, instead, by the prospect of investment in Canadian efficiency. I think we could turn them. I think we could turn some others as well.

I want to close by noting that before I make that case and before I take on that challenge, there is a great deal that needs to be done. You can not sell conservation for export or make a success of it on the domestic side without substantial progress in identifying more conservation opportunities than have been identified so far and in developing the capacity to tap them. I would not make the proposal as enthusiastically as I do if I had not been heartened by the institutional will and commitment of B. C. Hydro to take on those challenges and meet them. If those challenges in fact prove insurmountable and Hydro concludes that the conservation resource is as small as it now looks, then I guess someone like myself would question the merits of long term export commitments given the magnitude of the uncertainties about future provincial needs that I have just laid out. But I hope and think that the inquiry will come to a different conclusion and I look forward to joining my traditional allies at B. C. Hydro in breaking down all those anti-competitive barriers to the achievement of what will be British Columbia's new conservation surpluses.

Questions

Bob Mussetter, California Energy Commission

What can you tell us about retrofitting existing facilities versus new standards on new construction?

Ralph Cavanagh

Commissioner Mussetter mischievously invites me to comment on the conservation resources associated with retrofitting existing versus new structures.

I think that there is a general consensus, which California has advanced, that conservation opportunities tend to be largest and cheapest in new structures for the simple reason that by installing conservation efficiency up front you are able to get a job done relatively cheaply and well. It can be a lot more expensive and more difficult if you wait. The significance, in terms of B. C. Hydro's immediate policy options, is that the province is looking at the current provincial forecasts to incorporate what are, by U. S. standards, quite rapid rates of economic development and growth in consumption, suggesting the prospect for substantial additions of new end uses to the B. C. Hydro system. That suggests both a peril and an opportunity. The opportunity is a lot of relatively cheap savings if you have the right programs in place to tap them. The peril is that many of the conservation opportunities associated with new uses, particularly long-lived new uses, are what Sue Hickey called 'lost opportunities' if you do not go out and get them initially.

If Hydro does not have in place programs that can reach out and capture all of the new construction and the new long-lived end-uses then everyone that comes in outside the program without the efficiency is going to be chugging away using power inefficiently, often for periods far in excess of even the current planning horizon. So that is a distinction I would want to draw on, a set of priorities I want to echo, particularly now, as the efforts are getting underway, that a special effort be made to target new construction.

I should close by recognizing Commissioner Mussetter and the California Energy Commission's contribution in helping all of North America, learn relatively straight forward ways, non-threatening to builders, that work in practice to get new construction done as efficiently as a life-cycle cost economics justify. And let me acknowledge the new residential and new non-residential building standards of the California Energy Commission, as a model that I think can be of enormous value right here in British Columbia even as can the model conservation standards that Sue Hickey talked about earlier this morning. Those are two excellent templates from which to draw.

Unidentified Speaker

You mentioned the cost of thermal power. In your estimation what is the cost to bringing that on stream?

Ralph Cavanagh

I will not cite any particular figure which is instantly going to create controversy because it will not be clear whether I am talking about nominal or real dollars, and it will not be clear whether I am levelizing and it will not be clear what the cost of capital is. New thermal is at the most expensive end of an enormous spectrum of supply alternatives. I hope that it would not be controversial to set, as a goal of B. C. Hydro, a policy that states that before any new thermal is built all less expensive opportunities and particularly all less expensive efficiency opportunities be exploited first. If I can get that commitment, my experience suggests that we will never have to worry about the cost of new thermal because it will remain an academic inquiry for as far as the eye can see.

A point that Sue Hickey did not make, but I think needs some emphasis, is that Bonneville's commitment is to buy all the conservation that is cheaper than new thermal before they build new thermal. At the time Bonneville began its least-cost-planning efforts, the Northwest was the power plant construction capital of the universe. There was coal and nuclear going up all over. The growth projection showed that it was going to be grossly inadequate and that there would be huge shortages of power in the mid 1980s. The result of a long and fruitful process involving both Bonneville and a number of other groups has been that the Northwest has indefinitely deferred the construction of all new large scale generators, thermal and otherwise.

As you probably know, the Northwest moth-balled two large thermal power plants known as WPPSS Units #1 and #3 that had $4 billion put into them. The Northwest did that not because it liked the thought of sacrificing $4 billion, but on the basis of the old poker principle that there is no point in throwing good money after bad. Bonneville's conclusion is that there are better buys out there than finishing those plants. So they are now mothballed.

My principle is best buys first. If you follow it and if you hear what Amory has to say about what some of the best buys look like, you will come to the conclusion that the question of what the next kind of generator we need is one that will be based on technologies that we are not even in a position to foresee yet.

Unidentified Speaker

You mentioned putting yourself in the position of a California power buyer. In that position what would you be willing to pay for power? Just ball park numbers.

Ralph Cavanagh

Everything depends on the duration and the firmness of the sale. The kind of sale that I am urging the province to make is one that is structured so that they do not involve the construction of new capacity. I am not suggesting the province should rule out long term sales. The California Energy Commission has said in the past, and Bob Mussetter can contradict me, that their position has been, it is worth paying up to, but not above, the amount of the alternatives available to California on the new generation side. Those historically have been as high as $0.06 and recently $0.08/kW.h for some of its small scale power production. I think it is certainly realistic to be thinking in terms of $0.04 to $0.05/kW.h for long term contracts. Amory will give you some sense of how much you can buy in the efficiency side, not just at that level but at levels less than that.

The point in any other market is you have to look at what you are competing with. In California you are competing with central, small thermal power plants typically hooked up to co-generation units and small wind which historically have been competitive in prices of $0.06 - $0.08 kW.h. Your job is to beat that. I suggest you will not beat it with new hydro and thermal, but you have got a better product to sell, a better product even than some of those technologies, about which many of us are enthusiastic.

Unidentified Speaker

What made California the enormous "sink" for the absorption of new electricity?

Ralph Cavanagh

Mr. Mussetter says 28 million people, but it is more complicated than that. First, California is probably further along than any other economy within reach of you in developing its own conservation resources. A lot of their cheap stuff has been acquired although not by any means all of it. Second, about half of California's generation is in the form of oil and gas. You can make it possible for California utilities to retire and displace that product. The economic value of doing that is truly greater than if you were selling into a system dominated by hydro power, which would be the case in the Pacific Northwest, or dominated by coal, which would be the case for some of your other markets.

Finally, it is obviously the sheer magnitude of the market. I do not, however, want to suggest that California is necessarily a bottomless sink or that the Northwest is. If you are active on export markets, as you have been historically and probably will continue to be, clearly you ought to be looking for your enduring competitive advantage. I do not suggest that any strategy is without risk. If Amory is right, California will ultimately determine that its own long term best course lies in the pure domestic efficiency not yet tapped, and not in long term imports from anybody including B. C.

I suspect that the California utilities will be somewhat late in acknowledging that, given recent past experience. You therefore may have an opportunity to sign them up before they figure out that Amory is right. If you can do that, more power to you. I can occasionally rise above regional prejudice to feel good about efficiency wherever it is going on and particularly to feel good about it if it begins to transform a general Canadian orientation to electricity exports. I see this province as the best hope for doing that, which is one of the reasons I am very glad to be here today.

Michael Anderson, Consumer's Association of Canada

I would like to commend B. C. Hydro and the Ministry of Energy. A review by Mr. Cavanagh of conservation potential in the province of Manitoba was considered by the government of Manitoba to be sensitive information detrimental to the economic interests of the province. It could not be discussed in a public forum before the Manitoba Public Utilities Board, so I am glad that we are reviewing these options openly here.

For the interest of Mr. Cavanagh and the people assembled, the latest version of the Sierra report from Sierra Club of Western Canada advances just such a conservation-based export sale. For sometime, a group of Canadians and conservationists from the United States have been working on a project known generally as the International Energy Conservation Project also working toward advancing such an export sale based on conservation energy.

The reason I raise this here, in a room full of parallel generators and others interested in creating a supply of resource exportable from other than hydroelectric production, is that conservation and parallel generation combined has an ability to do exactly what Mr. Cavanagh suggests. I would welcome any rekindled interest in this proposal by

B. C. Hydro or yourselves. I would also welcome any contact with the Consumers Association of Canada, B. C. Branch, about pulling this proposal together and further investigating such a sale.

Ralph Cavanagh

That gives me an opportunity to acknowledge a debt. It is indeed the case that proposals like this have been under way between several Canadian and Northwest groups. The most important of them has been the Northwest Conservation Act Coalition, an extraordinary consortium of Canadian and Northwestern U. S. interests, one of whose representatives, Jim Baker, is here today. I urge any of you interested in pursuing this further to seek him out.

The Coalition's Newsletter is the best source of information on the continuing question of the relationship between the two regions and the problems involved in developing these resources. I do not want to suggest that the ideas I have been proposing to you have leapt, without parody, out at you from the podium here today. There has been extensive involvement of a number of groups on both sides of the border. The NCAC and the Western Sierra Club Chapter certainly ought to be acknowledged.

Bob Mussetter

Did you think Sue Hickey's cost figures were too low?

Answer

No, I thought they were rather too high. One thing that Sue Hickey said ought to be emphasized more. She mentioned the Hood River Project and one point she made was that "The Northwest Power Planning Council told us to get 85% penetration of our conservation and we decided to test that". I was involved in the design of that project. It took us two years to enroll 85% of a demographically representative county in a project that required them to have their homes rebuilt substantially. It was not the kind of thing that you blindly do on a whim. We got 85% in two years and of the 15% that was left, half of it had already been weatherized under earlier utility weatherization programs. In effect, approximately 90% of the community was reached by utility conservation programs through marketing methods and techniques designed to be broadly applicable .

You are in a position to take the Hood River findings and adapt them to your own purposes. As you try to determine what the B. C. conservation resource is, you will see that the Hood River findings suggest you do not have to assume that, while there is a big technical potential, marketing limitations will prevent you from getting more than a small fraction. The most important single finding of Hood River and I agree that in scientific rigour it has no equal to utility experiment. You are limited only by the size of the resource. That is a marketing challenge. You are used to marketing challenges. If Bonneville can get

85%, I venture B. C. Hydro could try to get 90% and could get it faster. A precedent is out there, amply documented, that has profound implications for the overall calculation of the B. C. Hydro conservation resource and it bears close scrutiny from all of you.

PROPOSED DEMAND SIDE MANAGEMENT PROGRAMS

(EDITED TRANSCRIPTION)

JACK HABART

Market Planning Supervisor
CUSTOMER SERVICES
B. C. HYDRO

This morning you heard an overview of our resource plan and some information on the role that we expect Demand Side Management to play over the next twenty years. Now we are going to talk about some of the programs that we are considering. We want to do it now while the plans are still somewhat fluid because we want to share our thinking and get as much feedback from you as we can (Exhibit 1). We want to develop programs that make the most sense, or perhaps I should say the most dollars and cents, to you, our customers. Obviously, if we do not get the program designs right, so that they make sense to you, you will not participate. If you do not participate, we will not be successful as we go ahead in this direction.

I am going to spend a few minutes to talk about the way we expect Demand Side Management programs to work and also some of the alternatives that we consider when designing programs. Then the next two speakers are going to provide details about the individual programs.

The first thing I would like to say is that all the programs we are envisioning at this time are based on existing technologies, on products that are available today. With these programs we are getting more people to use these technologies and getting people to use them sooner than they would otherwise. Basically, what happens whenever a new product is introduced on the market is that a few people in the front end, who are called innovators or early adopters, purchase these products and start using them (Exhibit 2). In the residential sector, this may be the first person on the block with a microwave or the guy next door who has this strange thing called a computer in his basement. What happens after these first few people get involved with the product? More people learn about the product by word of mouth, still more people start to use them, and the adoption rate or the usage rate of these products increases. Finally as more and more people use them, and the market starts to saturate, the growth rate slows down.

We have taken a particular product, for example energy efficient lighting, and we have shown on the lower curve (marked 'without DSM') what we think the adoption rate of that product will be if we do not get a program for it (Exhibit 3). This adoption curve, of what would happen if we did not have a program, is built into our load forecast as natural conservation. What we want to do in this case is to accelerate the use of that product (Exhibit 4). We want to get more people using it sooner than they would otherwise. That gives us the curve on the left hand side (marked 'with DSM'). The energy saving that results from that program is the shaded area in the middle. This is the case of accelerated adoption.

Now we have a slightly different kind of case. As well as getting people to use the product more quickly than they would otherwise, we are also getting more people to use the product than they would if they did not have a program. An example of this type of program could be a residential building standards program. We know, for example, that the Federal Government has had the R2000 program for a number of years now and we know that it has only about a 2% or 3% market share in B.C. One of the areas we are looking at is a similar program, but one which we think will have broader appeal. We think we can get more people involved to build new homes to this standard, so we get an earlier energy reduction, and also a greater reduction and one that lasts over time. This is called enhanced adoption (Exhibit 5).

I want to mention here briefly that we have two types of Demand Side Management programs. The first is what I call the product based programs and includes things like efficient lighting, energy efficient motors or more efficient appliances (Exhibit 6). In this kind of a program we are providing some sort of incentive or inducement to get people to use the technology. The other kind of program is what I would call a system based program. In this case it is something like a building standard where you are bringing a number of components together, such as insulation, glazing, and sealing. By making a better system we can make more efficient use of the energy. This provides a bit of a framework for discussing some of the incentives and program design alternatives.

How are we as a utility going to get people to use these products sooner or get more people to use them? There are a number of options we can use (Exhibit 7). We could use legislation and standards. It has been used in the U.S. for building standards and for things like residential appliance standards. Ontario is also in the process of introducing residential appliance standards. Another way we could affect the adoption of these more efficient products is through our rate structure (Exhibit 8). We could encourage people by adjusting the price of energy. Historically, Hydro has only used this for load building programs such as the Electric Plus program where the lower price is used to encourage people to make a different use of the energy.

There are a number of other things we could do. The option you choose is largely a function of the sort of barriers in the market place, a function of why you think people are not using the products. For example, the problem may be a lack of understanding of the benefits of a certain product in their particular installation. Then audits, consulting, or direct contact are in order to identify the benefits of making this change in plants or buildings. If the problem is that people do not understand how to use the technology because it is complex, it is new, or there is not much information available, we can undertake things like training and education programs. If it is a problem where people are not aware of a product because it is relatively new in the market place then we can get involved in advertising and promotion programs to help make people aware.

One of the larger areas where we can help the market place is when the economics are not quite right for a particular product. Then, perhaps because of Hydro's avoided costs, (the lower cost of conservation versus building new dams) we can help resolve financial problems. There are a number of different ways we can do this. If it is a product-based program we could provide a rebate, (i.e. so much money per fridge or so much money per lamp). If it is a system based program, we have to estimate the energy savings that result from that particular system and perhaps pay a rebate per kilowatt hour saved or per kilowatt of demand saved.

However, there are difficulties with all of these approaches. We know that the industrial customers and the larger commercial customers are more interested in the payback of that investment opportunity. Perhaps we can get involved and help them understand what the payback is if there is no funding from the utility and then find out how much extra money would be required so that the new product fits their criteria. For example, if we are looking at new motors for a saw mill and the owner requires a three year payback on this kind of an investment, then perhaps we can determine how much money is required to help bring the cost down to the three year payback. In this way, the customer is meeting his criteria, and as long as the resulting energy cost to us is low enough to meet our criteria, this may be a viable way to go. However, this presents some problems to us because we do not know that much about how you make your financial decisions and what your criteria is, so we would have to work together on this kind of a program.

The last area that I wanted to reference is what I call an assured savings or guaranteed savings plan. In this situation, a third party provides the funding for the necessary investment and then uses the resulting savings in operating costs to help pay back that investment. This has some attractions in the areas where it fits. However, it leads to a number of questions. Who should provide the funding (Exhibit 9)? Should it be B.C. Hydro? Should it be a lending institution? Should it be the service industry or some mix of all three? Similarly, who should administer the programs (Exhibit 10)? Should it be done by Hydro staff directly? Should it be third parties? I think there are opportunities for the consulting and the service industry. We certainly cannot overlook the last area which is customer initiated conservation.

This is an overview of some of the things that we bring together and blend into a program. What we are really looking for is some feedback from you (Exhibit 11), as to what blend of these features is of most value to you. As you are probably aware we have a display outside, which is manned during the coffee breaks and where we would be very interested in talking to you. We have also provided a questionnaire in your package so that you can give us some feedback. There will be a question and answer session later today and also a panel discussion tomorrow, where we can have an opportunity to start the dialogue.

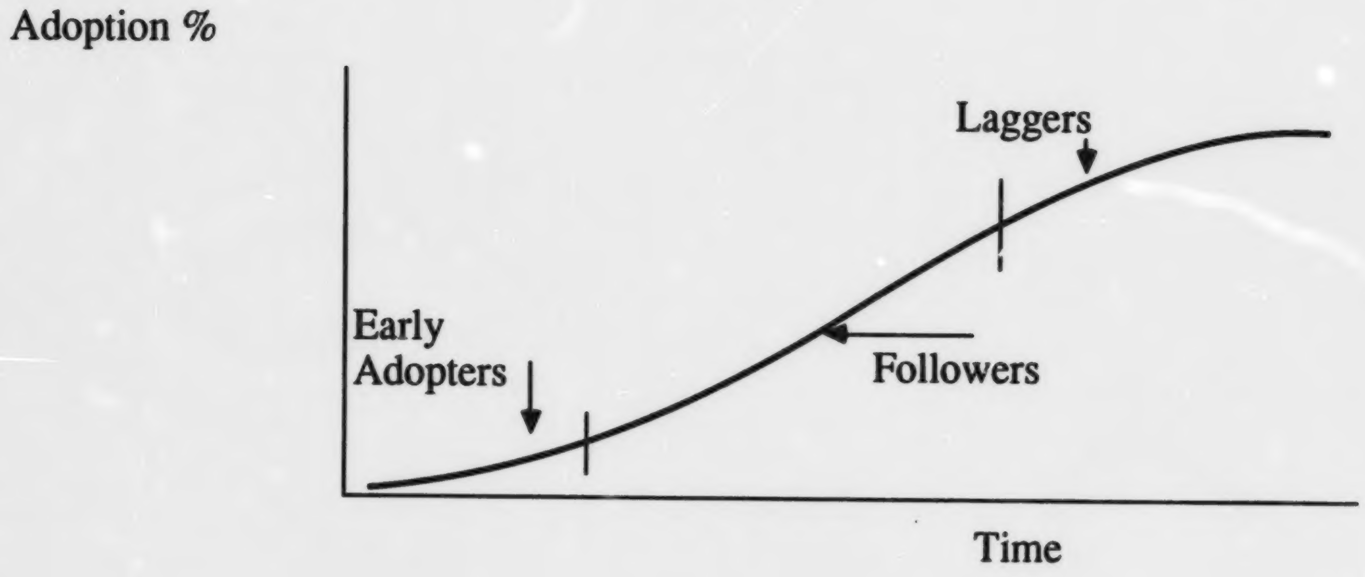
PRESENTATION OBJECTIVES

- Share current program approaches
    - Objectives
    - Strategy
    - Incentives

- Obtain feedback
    - Value to you
    - Incentive
    - Program delivery

Exhibit 1

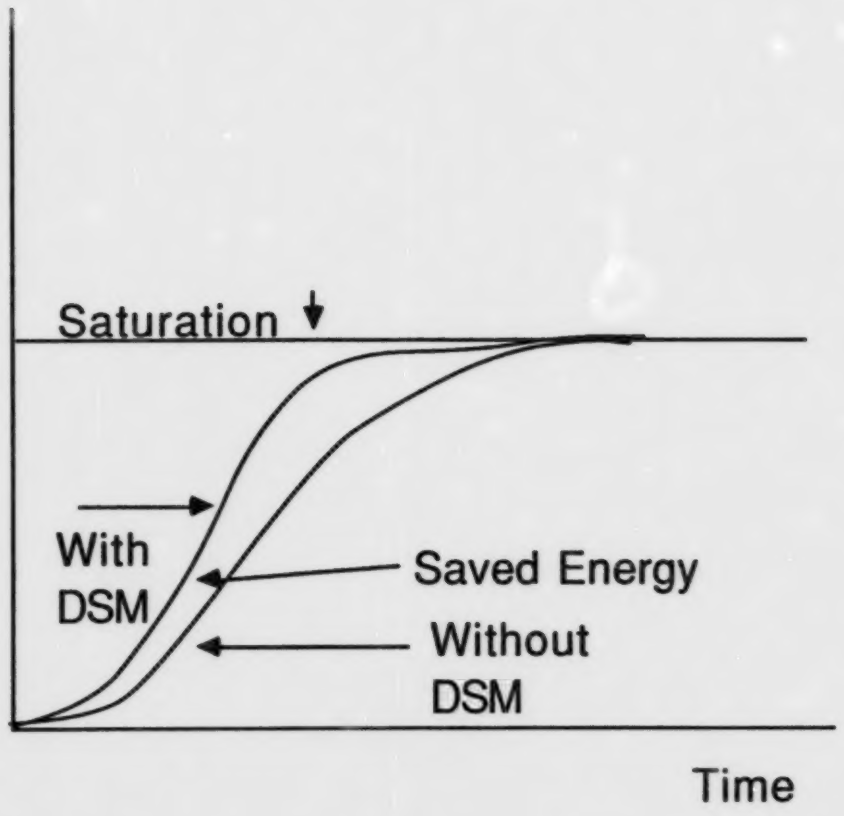
HOW DOES DSM WORK?



Typical New Product

Adoption Curve

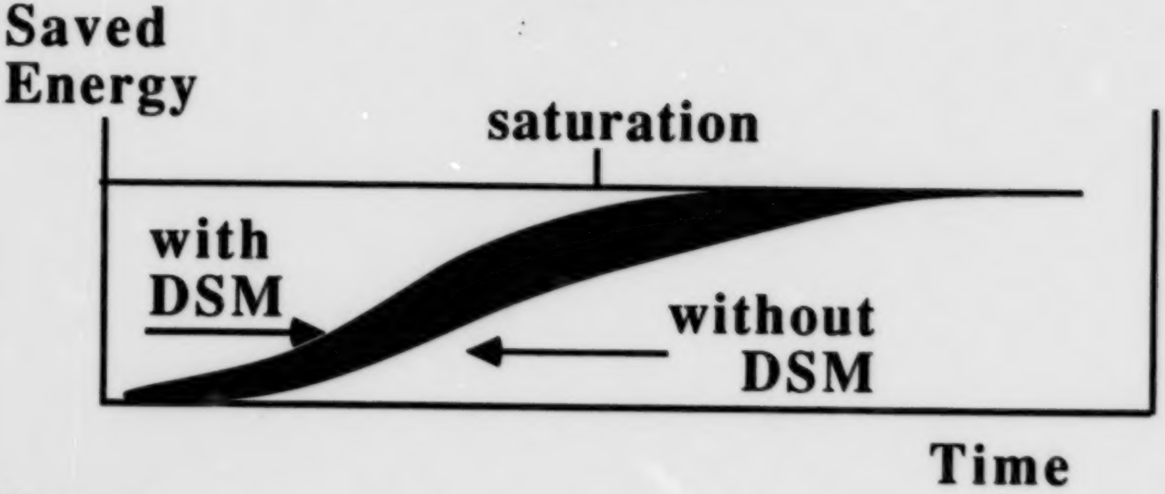
Exhibit 2


Saturation
With
DSM
Saved Energy
Without
DSM
Time

Accelerating Adoption

Exhibit 3

Accelerating Adoption



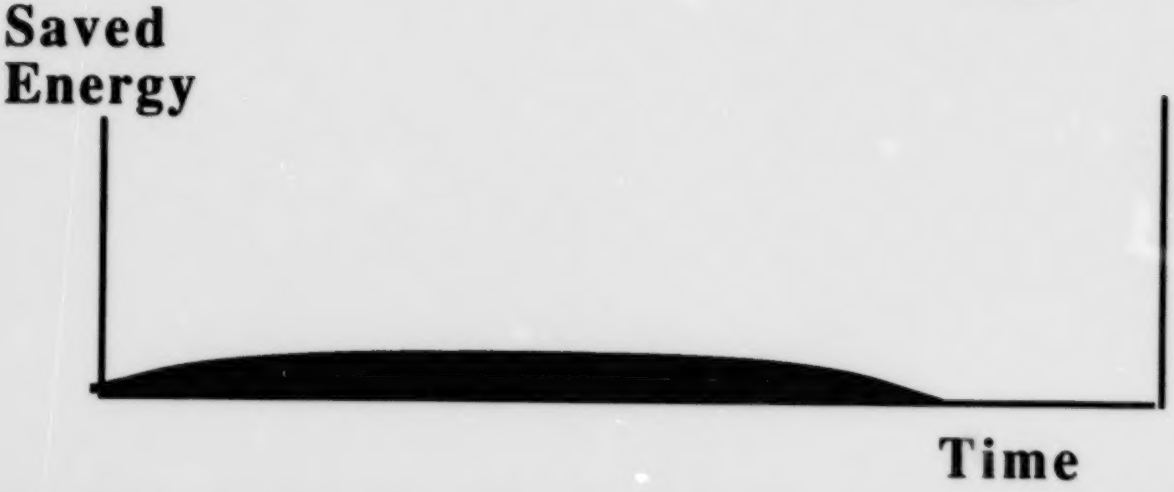
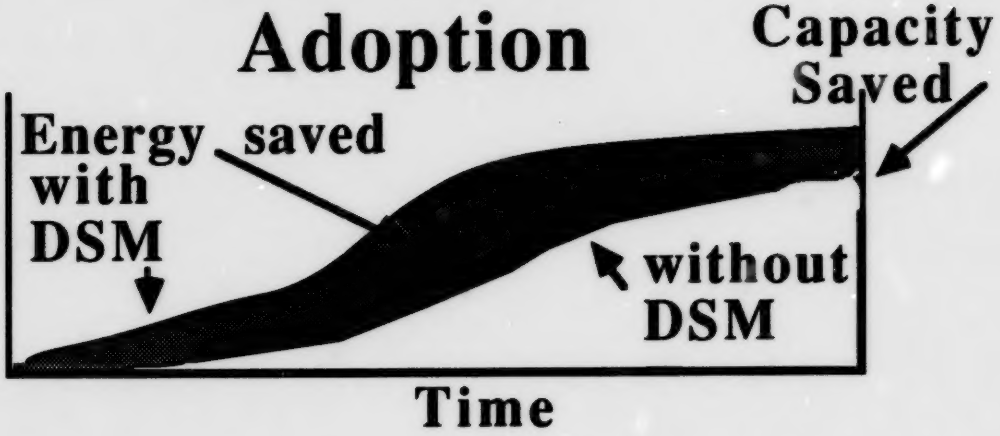


Exhibit 4

Enhanced Adoption



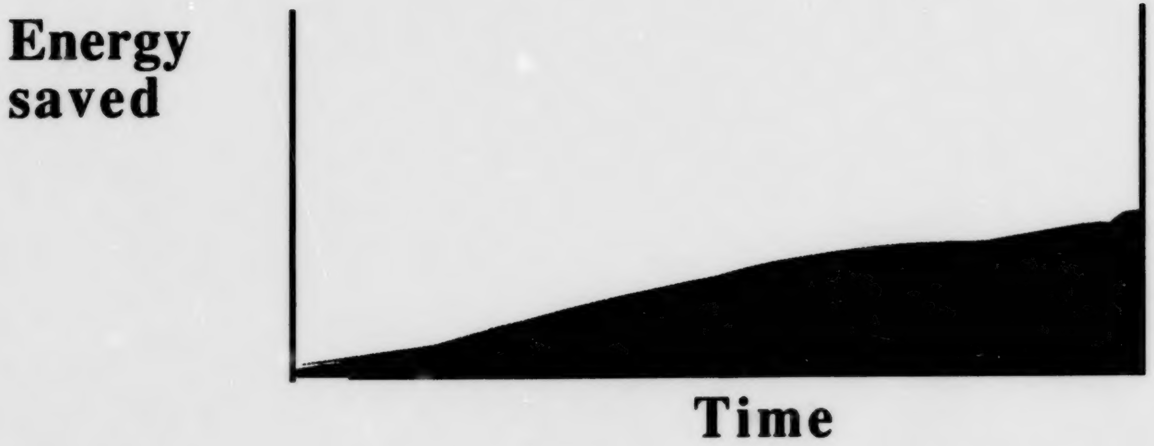
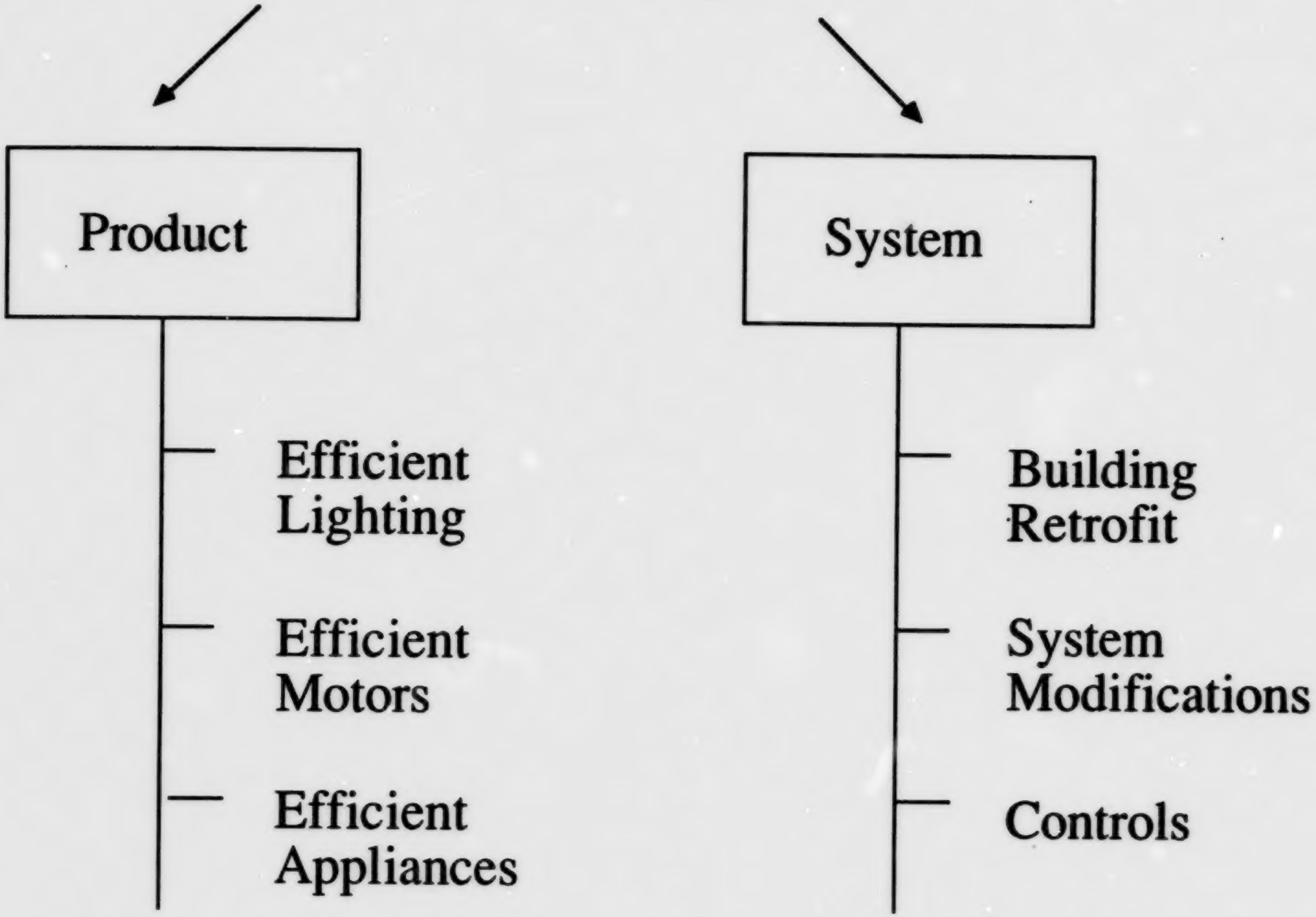


Exhibit 5

General DSM Approach



Product

- Efficient Lighting
- Efficient Motors
- Efficient Appliances

System

- Building Retrofit
- System Modifications
- Controls

Exhibit 6

Types of Incentives

- Direct Incentives
  - Grants/Subsidy
  - Loans
  - Guaranteed Savings
    - B.C. Hydro
    - Third Party

- Advertising & Promotion

- Training/Education

- Audit/Consulting/Direct Contact

- Rates

- Legislation/Standards

Exhibit 7

Incentives

By Product
- $ per fridge etc.

By Energy Saved
- ¢ per kilowatt hour

By Payback Period
- Hydro will reduce initial cost (through incentive) to bring payback to a certain period
- How long should the period be?
- Should it be a function of the application

Assured Savings
- A guarantee of certain return on investment

Exhibit 8

Financing

By:

- B.C. Hydro
- Lending Institutions (banks, etc.)
- Service Industry
- All of the above

Exhibit 9

Implementation/
Administration

- By B.C. Hydro Personnel
- Special Contractors/Arrangers
- Consultants/Service Industry
- Customer Initiated

Exhibit 10

WE WANT YOUR FEEDBACK

- Questionaire in Registration Package
- Question & Answer Session Later Today
- Panel Discussion Tomorrow

Exhibit 11

PROPOSED DEMAND SIDE MANAGEMENT PROGRAMS

(EDITED TRANSCRIPTION)

ZAK EL-RAMLY

Energy Management Supervisor
CORPORATE AFFAIRS
B. C. HYDRO

After Mr. Cavanagh's statement I find myself needing to change my presentation a bit. B. C. Hydro started its conservation efforts back in the early 1970s like everybody else. In the early 1980s we started looking at what we call purchased conservation. This is paying customers to save energy so we do not have to build another dam. However, we started to look at conservation or demand side management as a resource only last summer. The programs that I am going to present are ones we feel confident we can achieve. We are confident these will materialize and we feel confident we can put them in the resource plan. However, that is not all, if we can come up with additional programs, if the industry shows us more programs, if technology develops, or if Mr. Lovins can convince us of a new idea, then they will be added. On the other hand, if we find out that some of the programs are not going to work, we will change them, or drop them altogether. What I present is not necessarily cast in stone; it is our first crack at DSM. Most of the programs are still in the pilot stage and we hope to launch a full scale program very soon. The potential we present is over and above what we expect the customers would have done themselves without intervention. This is not the total conservation program in the province; this is what we expect to increase over and above what is normally happening. It is the difference between the status quo and what we intend to do with our programs.

The pie chart shows a breakdown of energy use in British Columbia (Exhibit 1). The potential we identified is proportionate to the energy sales. There is more potential as a percentage in the commercial sector than in the residential and industrial sectors. I will address the residential programs and the commercial programs while Derek Henriques will address industrial programs.

This histogram represents a breakdown of energy use in the residential sector (Exhibit 2). You will see that the highest use is in the fridge and freezer area, followed by other large appliances, such as dryers, then water heating, space heating and lighting. It may not sound reasonable because space heating has the highest energy consumption. However, residential customers who use space heating in the province represent only 15%, so what is presented is a weighted average. It indicates where we should put our effort.

Looking at the areas where there is potential, we have space heating, water heating, appliances and lighting (Exhibit 3). Space heating provides several options. First, make the load disappear, for example, by converting the application to gas (Exhibit 4). You encourage potential future loads to use gas for space heating and get existing customers who only use electricity for space heating to convert to gas. This is equivalent to conserving the load down to zero. Another approach would be to convert the load from a firm load -- a load that we have to supply -- to an interruptible load. This is the whole idea of the Energy Plus Program. Since our supply is not consistent but fluctuates with the water condition, when we convert the customer from a firm load to an interruptible load it represents a savings of the firm energy. Of course, there is a third level of customers who are going to remain on electric space heating to improve their efficiency, so you can supply their needs at a lower energy cost.

We have two types of customers, the existing class and new or future customers (Exhibit 5). For the future, our primary market would be the row housing and the townhouses, because we have a higher penetration of electric heating than in the single family dwelling. Our major thrust with the program is to try to induce future buildings to go to gas rather than go electric. The program is in cooperation with the gas companies (Exhibit 6). There are reasons why some of the builders will not go to gas and some of these are technical reasons. If we can help them address these technical barriers for example, the availability of small boilers and small furnaces or the separate metering required then the switch might occur naturally since gas is a cheaper fuel for space heating in this province.

Another approach is to start some demonstration projects. Using natural gas might not be economically viable in the beginning, but by demonstrating the technology we can show the consultants and the contractors how it could be done. We are at this stage right now. After we demonstrate the concept and address the technical barriers, we will develop some training program for the consultants and the trades. We will initially deliver the program through advertising and promotion and if all this does not work we might give some incentives.

The second level of the space heating program is to switch the customer from a firm load to an interruptible load (Exhibit 7). This is the idea of the Electric Plus Program and in this case the customer must have a back-up fuel. Again, promote it through selling the electricity at a lower cost, subsidize the conversion and provide training and seminars. We have done that successfully so far. We have over 3,000 customers as interruptible load on the grid right now.

For new buildings that are going to use electricity for space heating, we have to start promoting building efficiency (Exhibit 8). The approach right now is to capitalize on to the success of other projects, in particular, the R2000 Program. We are trying to make energy efficiency a common practice rather than offering it to the elite for very expensive houses only. As well, we are trying to work with the building industry to train the builders to construct energy efficient homes at the same time we promote it with the customer.

The idea of energy efficiency is to make the energy efficient home a standard home. The program design does not include an incentive but includes education and promotion. Currently 80% of construction in the lower mainland is still 2 x 4, so we have a lot of potential there (Exhibit 8). In other areas of the province the potential is not as great. Our strategy in this case, because we do not have legislation, is to develop high efficiency standards (Exhibit 9). We intend to publish and promote them as a standard and work with the Canadian Home Builders Association and the R2000 Program to promote the standard within the trade. We also intend to get some form of certification to acknowledge that the customer has purchased an energy efficient home. This will give him some value for his money by giving the home a higher resale value. We will rely on the industry to develop the training rather than our own people.

In most of our programs we want to exercise leverage rather than pay for the full cost of the program either by training, promotion or incentive. If a group like the Greater Vancouver Home Association is willing to have us help them, we will provide some financing and we will get them to do as much of the work as possible. We are not fully purchasing the conservation efforts; we are trying to use money as a leverage to switch the industry.

For the existing-home program we will wait until we launch the new-home program, until we have promotion in place and until we develop a high efficiency standard mentality in the province within the next year or two. After that, we will go to the retrofit market and tell the customer their building now needs to be retrofitted. In other words, we will establish new standards and new thinking and later we will go to the existing stock and ask them to convert. In this case, we might provide low interest loans or other incentives. We have not, as yet, decided.

In almost all programs, we are going to promote more than just the energy savings and the cost savings (Exhibit 10). There is always a second benefit -- the warm feeling, the quieter home, the draft free and cleaner home. We might suggest they build as a part of the home, an air cleaner, air-to-air heat exchangers and other such items that would add value to the house besides lowering the heating cost. You can see that lower heating costs comes last. From B. C. Hydro's point of view, we are trying to demonstrate how much we save. In this case, five energy efficient homes will use the same energy as two inefficient homes built to current standards. This program, if it meets our target within the next 25 years, will save enough energy to operate 235,000 houses for a year, over the next 20 year period.

About 50% of the customers use electric water heating (Exhibit 11), a lot of whom have gas space heating. If you look in terms of potential, there are a lot of customers who already have gas piping and gas mains. Switching them from electricity to gas might not be too expensive (Exhibit 12). Our approach is to promote the idea to the customer, show him the advantages and cost difference and give him an incentive if there is not enough justification for him to do so on his own. But it is always the customer's choice. It will remain the customer's choice unless it is legislated.

For those who must remain on electric domestic water heating, we have to improve their efficiency and will have to consider new stock. For existing stock it is simple, just throw a water heating jacket on the tank. In this case, the cost of adding the jacket is 30 or 40 dollars, but the customer only saves a few dollars a year. We do not believe that the customer will do it on his own. However, we believe that there is enough of a benefit to Hydro that it should be done. For this program we are doing it free of charge for the customer.

We have done several pilot programs with the domestic water jackets. We did it in a small community at Anaham Lake about 4 years ago. Last year, with the help of Energy, Mines and Petroleum Resources, we did it in a few diesel-area communities where energy costs were very high (Exhibit 13). We could afford to start the program there although it costs more in the initial stages. If the program is cost-justified in a pilot stage, it has a higher chance of proving itself than if you tried without it being cost-justified. Trying to start the program in an area where we can cost-justify the higher initial cost gives the concept additional credibility. Therefore, in this case we tried the program in a diesel area. We had about 3,000 domestic water heating jackets installed and we achieved over 50% penetration in just one year. We achieved the energy savings we were expecting. It was measured indirectly from the billing statistics savings.

Because of the success of the first program, we are currently expanding it to four or six communities in the main integrated grid. We are still calling it a pilot program because at this stage, we are still getting the Hydro system used to doing this kind of business -- getting tenders in, contacting customers, handling work loads -- because if we can have a smooth launch our chances of long term success will be higher.

We are also going to try to reduce hot water consumption through the installation of either a shower restricter or a high efficiency shower head. The diesel area program results were not conclusive about the savings from adding a shower restricter. Therefore, with our existing program we will try more elaborate high efficiency water heads and we will retrofit some communities, then compare the savings within the next year. If we find that it pays for itself we will move. Otherwise, we will discontinue it.

A lot of high efficiency domestic water heating tanks are available right now. When we retrofit older ones we will give the customer the option of getting a coupon. If he thinks that his tank is at the end of its life, we will give him this coupon that he can redeem when he changes his water heating tank to a more efficient one. As well, we will launch a program to get customers to buy the more energy efficient tanks (Exhibit 14). Again the benefits are, from Hydro's point of view, lower operating costs, which means savings from the customer's point of view. Besides the lower costs, there may be a higher rate of recovery of hot water.

When we examined the saturation of appliances in our area we found that about 115% of the customers have fridges which means that about 15% of the customers have two (Exhibit 15). In a lot of cases people buy a second refrigerator and keep the older one because they can use it every now and then. That consumes a lot of energy. We are launching a program to remove them from the homes if they are not really needed. We feel that to do so we have to buy them. Meanwhile, we are advising the customers to buy high efficiency refrigerators if they are shopping for a new one. We tried that in the diesel area in early February and the sales of older refrigerators were fascinating. We had approximately 50 customers return their old refrigerators in a community of 2,000 in about 45 days.

In this program we are trying to achieve two things: reduce the penetration of a secondary, unnecessary refrigerator and ensure that when the customer buys a new refrigerator he buys one that is energy efficient (Exhibit 16). We are also offering to pick the old refrigerator up ourselves and in the diesel area we have contractors do it. If we start in the integrated area we might have a local charity pick them up. We are also looking at how we are going to dispose of the refrigerant and the freon. We are working on a system to try to collect the freon.

Whenever we specify energy efficient appliances we will supply a list. One side benefit of our fridge program which only ran for 45 days in one community and which collected about 50 refrigerators, is that the industry got the signal that Hydro is interested in promoting high-efficiency refrigerators (Exhibit 17). We have a member of our group working with the Canadian Standards Association. The Canadian Standards Association is trying to pass some rules, so that only the high efficiency refrigerators will be sold in 1992 and 1993, a result of legislation just passed in the States. But the Canadian manufacturers want more time. We are able to trade with them, dropping the bottom or the least efficient product for a year or so, and we believe that because we have shown action in this area, that we have managed to get some response from the industry.

Lighting is another area where we have tried some programs with success. You will be hearing more about lighting from Mr. Lovins than from me. You can now get a compact fluorescent tube that will consume about 14 - 17 watts to replace a 60 watt incandescent (Exhibit 18). There are two problems with the product. First nobody knows about it; second, it costs about 10 to 12 times as much. When people simply do not know, you must promote it. However, with the higher cost you have to find other attributes besides energy savings. In this case, the light bulb lasts ten times as long as a standard incandescent. In this case we are promoting not just energy efficiency, but energy efficiency that lasts. It saves you ten replacements even if you are a residential customer. A lot of people are interested because they do not like changing light bulbs.

As I hinted, we decided we have two problems, people do not know about it and the cost (Exhibit 19). Therefore, we ran a test in the diesel area and gave them their first light bulb free to simulate a mature market. It worked. Within two days more than 85 percent of the customers took the free light bulb. They knew it was worth approximately $16.00 so everybody came. Within two days we managed to carry it to a community that was not aware of it. We gave them a coupon for the second one for $5.00 to test if people are willing to pay five times as much for the product. We do not have the final figures, but there was about an 80 percent response to the coupon. At least we know people are willing to pay five times as much as the price of an incandescent.

Third step, we are going to make them available at retail outlets for $9.95 or $10.00 to test if consumers are willing to pay ten times as much for a product that is going to last ten times as long. If it works it gives us an indication what the full-scale program is going to look like. Also very honestly, we knew of the existence of these products only last year. We were not familiar with them.

If we, ourselves, did not know about this product we do not expect the customer to know. We also expected other problems so we decided to do it slowly to discover problems with the products. When we promote them we will include all their characteristics. If they flicker our promotion has to inform the customer of that and if they take a second or two to come on then we have to tell the customer that as well. If we can tell the customer the full story from the beginning then there is a possibility the program will succeed.

We have got one advantage and one disadvantage inherent in our initiatives. We are planning an integrated DSM package that includes industrial, commercial and residential sectors at the same time. Not too many utilities have this option. We are taking advantage of some of the experience of other utilities. However, because we are launching many programs at the same time if you make a mistake, then there will be a spillover to those other programs. Likewise, successes could spillover to other programs.

From the customer's point of view, the new efficiency lighting offers labour savings and cost reduction (Exhibit 20). There is no reduction in the quality although sometimes the colour is different than incandescent but at the same time the colour is probably higher quality than incandescent. From Hydro's point of view, if this program is successful over the next 20 years, we can save enough energy from lighting alone to serve 90,000 homes.

Dealing with the commercial sector is more difficult (Exhibit 21). The commercial sector is different than the residential sector. Homes are very similar, so you can apply generic programs more easily. Light bulb programs, fridge programs or high efficiency water tanks are the same. You can promote them in a generic way. In the commercial sector you cannot do this except perhaps for lighting or motors. Our approach is to improve future building through improving the design using almost any opportunity to capture all the new building. We are also going to try to retrofit existing buildings.

We are still going to use the generic approach, promoting high efficiency lighting, reflectors, electronic ballasts, motors, and in trying to improve the efficiency of the system, computer control and regulator control (Exhibit 22). So for building design, we believe we have to finance the design part. Consultants are paid as a percentage of the mechanical engineering systems costs. They are not paid for spending more time to develop a more efficient building. If we finance the design of new buildings, then we have a higher chance of getting that design in place. A survey we did a couple of years ago indicated that you can improve the design, reduce operating costs and in most cases reduce the initial cost of installation. The only person that does not benefit from this process is the mechanical consultant.

It is important to establish a base energy consumption, a budget or a prescriptive standard. Once we have that, then we are going to separate the buildings into three categories; small, medium and large size. We will help the consultants do the analysis and perhaps we will have to compensate them for the additional time. In doing so, we might not end up with a more efficient building that is cheaper than a regular building, so we might have to offer the owner or the developer some assistance towards the capital costs. We will also develop awards or recognition programs similar to what BPA did with the "H" program. If we are going to give some assistance towards the capital costs then we have to inspect and verify to ensure that the design that we agreed upon is in place. We have to monitor energy consumption to prove that we are getting the savings we expected.

For the building retrofit in the commercial sector we would probably have to give some incentive to make it happen. We plan to run a 10 year program in which we offer some help with the audit. We will attempt to find out what is an acceptable return on investment and then attempt to bridge the gap between that acceptable pay-back and the actual retrofit costs.

We expect the industry and energy service industry, in particular, to take the lead helping us develop and implement the program. We can have the audit done by the owner's energy service companies, the manufacturers, or control companies who perform audits. Other aspects of running a program like this include negotiating retrofit options. We might do some stimulation or help do some stimulation. How do we negotiate paying some of these incentives? What do we base them on? On saving per kilowatt hour? On a certain generic approach? How do we approach the industry? We are looking forward to feedback from the industry. Currently we are negotiating an agreement with B. C. Tel to use their building as a demonstration project for our retrofit program, and we are looking for a new design for a new building to use as a pilot project. We are trying to learn the system, to learn how to deal with problems through one or two buildings in the beginning and then find our way through. So if you have some prospective buildings we can use, please talk to us.

On the generic side we already have started a pilot program to try to replace 40 watts fluorescent with 34 watts (Exhibits 23, 24, 25, 26). You get about 15% reduction in energy cost with only about 6% reduction in lighting. Mr. Lovins does not agree with our existing DSM plan. He argues that this is not the most efficient way of retrofitting lighting systems. He is absolutely right. We are using this as a first step, but we are also looking at reflectors and other advances in the lighting industry. He argues that if we do that people will be satisfied with just replacing these and saving 15% and he asks why don't we do the full scale program. The lighting program has been tried for about three months in our Greater Vancouver area. We have managed to convert 130,000 bulbs paying $0.25 for each light bulb changed. This is equivalent to the difference between a 40 watt and a 34 watt. We are currently analyzing the data we received from customers. Why did they take our offer? Or why didn't they? We hope to use the information to help us develop the full scale program.

The last area to look at is electric control (Exhibit 27). We have not really developed a program in this area yet. We know that there is potential but we have not managed to decide how we are going to perform it. Looking at increased efficiency, using computer control are all aspects of improving performance through improving the control of the system.

This was a quick summary of the programs on our drawing boards, and I emphasize drawing boards because we can add programs (Exhibits 28 - 34). We can identify programs and expected load reduction by the year 2007 -- 20 years from now, and the total expected load reduction in 20 years. We estimate that in 20 years the total reduction in the residential sector will be almost 800 GW.h/year. The programs have a zero in front of them. For example, with domestic water heating when you take a jacket you put it on a tank, the tank's life is about ten years. We expect once the tank is gone the customer will want to fix the house to be energy efficient. Therefore the savings are only during the periods that the old tank is there. We expect about 800 GW.h/year in the residential sector, 1,500 in the commercial and another 1,500 in the industrial sector. Thank you.

Questions

Roger Blagburn, Robson Valley Park Corporation

I notice what you are doing is following what the Federal Government did in the home energy savings field. It looks like you are falling into the same trap. I am a commercial contractor in saw mills and heavy industry and I fear what you are heading for, when you place a subsidy on anything be it a more efficient hot water tank or light bulbs, is that the price of that article will go up by the amount of the subsidy. This was proven with off-oil programs, the CHIP program, and anything else you care to mention where the subsidy was paid to the consumer to buy an article that was more efficient.

Second, why don't you just raise the price? Wouldn't it be cheaper? You would make more money and the consumer would be encouraged. Look out in the parking lot, you see no more 58 Desoto's driving around. All the cars are little, small and fuel efficient strictly because the price of fuel, not because everybody was concerned about the environment or reducing our consumption of petro-chemicals.

Third, your examples seemed to be aimed at residential which is only one-third of the market. The big power users are commercial and industrial. I see nothing that I can take back to any of my customers to justify using more efficient motors and more efficient processes. They already are using the most efficient lighting system that they can come up with at the moment. Most of them are on mercury vapour and now converting to sodium vapour. I wonder how much of this is going to be a net cost to consumers.

Zak El-Ramly

You are right. There is the chance that when you give incentives the trades will jack up the price. We are quite aware of this. We try to establish some form of a base rate or base price and work from there. With water heating we are wondering whether we should pay the incentive directly to the manufacturer and get him to not sell the lower efficiency products. It is a problem. All I can say is we know of it and we are trying to avoid it. The other thing is to do nothing and the do-nothing scenario is obviously not acceptable to us.

As for raising the prices, do you believe that most other British Columbians would share the same concern? If you provide more efficient products for us, you say it will increase the value of our homes, properties, or commercial enterprises. All that means is that we have to borrow more money to buy the thing and it goes on our mortgages and on our property taxes. There is no free lunch.

The whole idea of demand side management is that we provide the energy through saving of energy rather than building the energy. Any kilowatt hour that we generated through purchasing it from the customer would be cheaper than the other alternative which is generating it from an electrical station. You are suggesting we penalize all the customers -- increase the rates so they reduce the consumption automatically. The whole concept is to have the customer enjoy electricity. We are only going to show him a cheaper way of doing it.

Because we are not quite so sure that he is going to be convinced that this is a cheaper way of doing it we are going to spend some of our own money to do it. But we are not trying to change the lifestyle of British Columbia. We are trying to increase the energy efficiency. We want him to use the hot tub and a cover, use the pool and a cover and live in a nice big home with lots of windows double glazed. We want the customer to do what he wants without sacrificing lifestyle. Increasing the price could end up changing the lifestyle.

Third question. The emphasis on the residential is only in the presentation because it is the easiest to handle. If you want to start a residential program it can take a month or two, but if you want to try a commercial program it is not as easy. When we want to try these light bulbs in a community, we can walk into the Queen Charlotte Islands and in two or three months we can reach every single customer and develop our expertise quickly. The commercial sector is not that easy. It takes about a year to design and a year to build. But if you look at the potential, there is 1,300 GW.h load reduction in the commercial sector and only 800 GW.h in the residential sector (Exhibit 35). You are correct. There is nothing specific that you can take back.

Electricity Use in B.C.

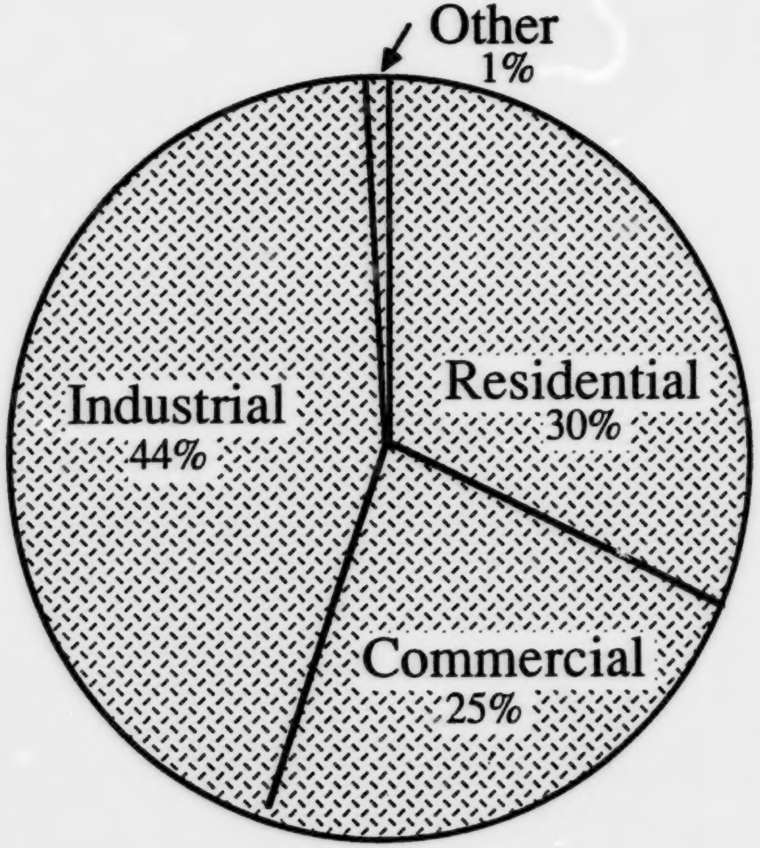


Exhibit 1

Total Energy Sales

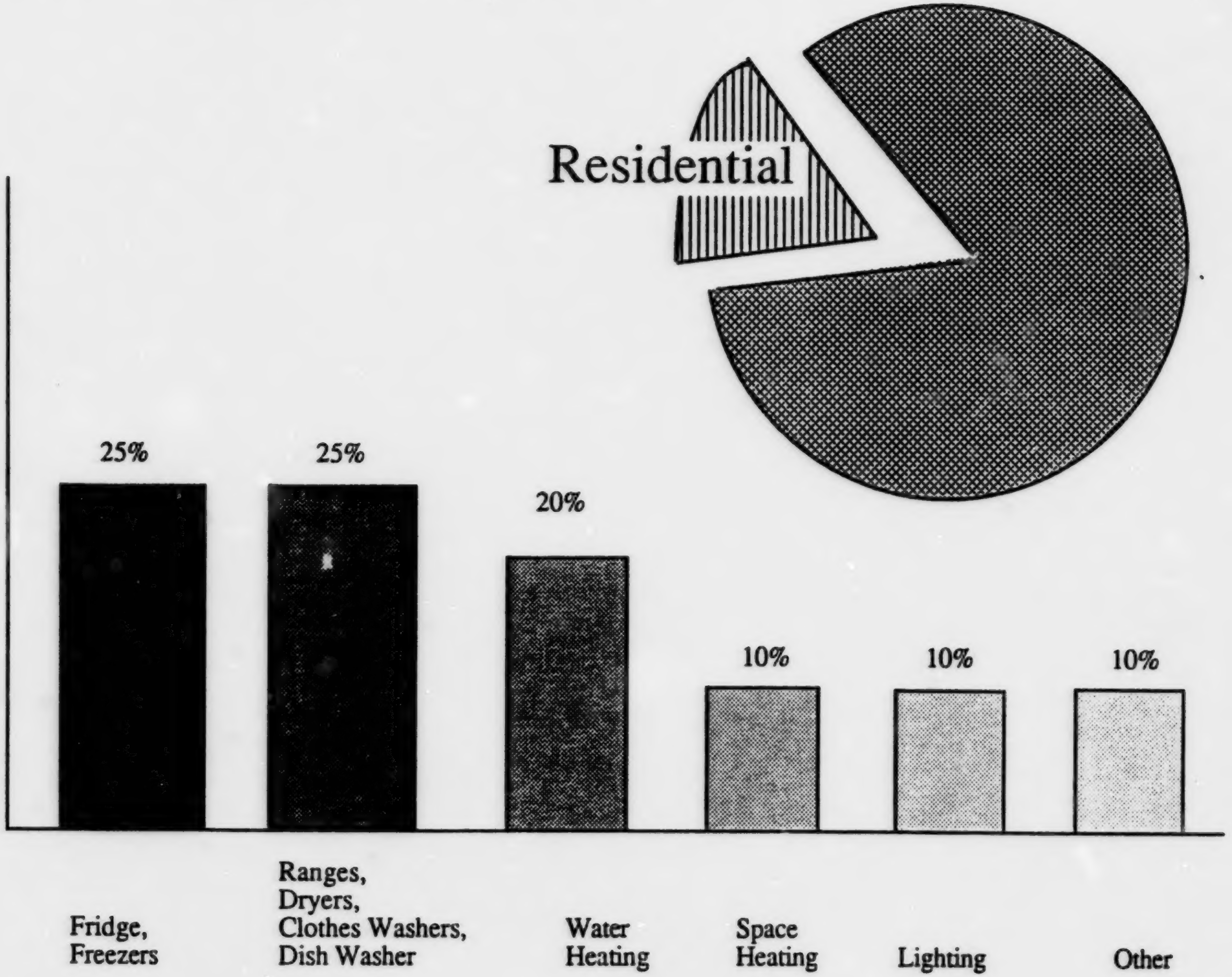
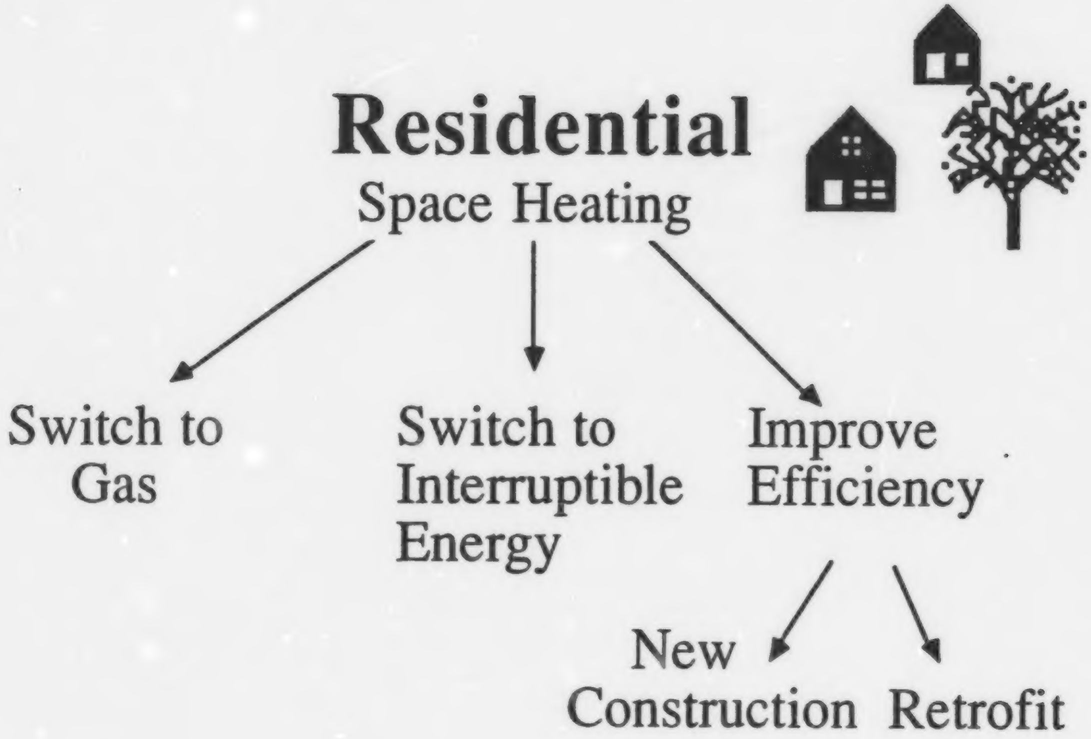


Exhibit 2

Residential Programs

- Space Heating
- Water Heating
- Appliances
- Lighting

Exhibit 3



Residential

Space Heating

Switch to Gas

Switch to Interruptible Energy

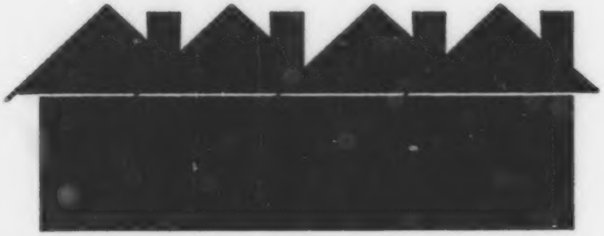
Improve Efficiency

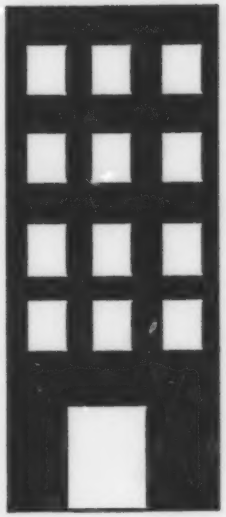
New Construction

Retrofit

Exhibit 4

Fuel Substitution





- Primary market is row houses, town houses and apartments
- Current Situation:
  40 - 60% of new construction is electric

Objective:

To reduce future electric load growth by shifting electric heating applications to natural gas.

Exhibit 5

Fuel Substitution

Strategy:

- Promote with Gas Companies
- Addressing Technical Barriers
- Demonstration Projects
- Training
- Advertising & Promotions
- Incentives/ BCH Support/ Cost Analysis

Exhibit 6

Interruptible Energy

Objective:	To develop a domestic market for secondary electrical energy
Target Market:	Residential & Commercial Customers who use oil/propane and do not have access to natural gas.

Exhibit 7

Building Efficiency

Primary Market

- Single Family Dwellings & Duplexes
  - New Construction
  - Retrofit

Current Situation

80% of new construction in Lower Mainland/ Vancouver Island is still below optimal.

Energy consumption of existing homes is 40% greater than new efficient homes.

Objective

To reduce future electric load growth and consumption by promoting higher building standards and increasing level of insulation in existing homes.

Exhibit 8

Building Efficiency

Strategy & Promotions

New Homes

- Develop new high efficiency standard
- Work with CHBA and R2000 to develop program
- BCH Certification
- CHBA Training & Instructions
- BCH Advertising & Promotion

Existing Homes

- Build on New Home Program
- BCH Incentive
- BCH Computer Models
- Advertising & Promotions

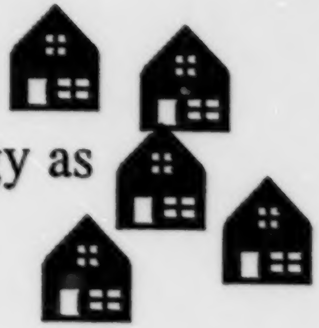
Exhibit 9

Benefits

To Customer:

- Increased quality of home
  - Warmer
  - Quieter
  - Draft-free
  - Cleaner
- Lower operating costs

To Hydro:



- Five efficient homes will use the same energy as two inefficient homes.
- Sufficient energy saved equal to 235,000 homes

Exhibit 10

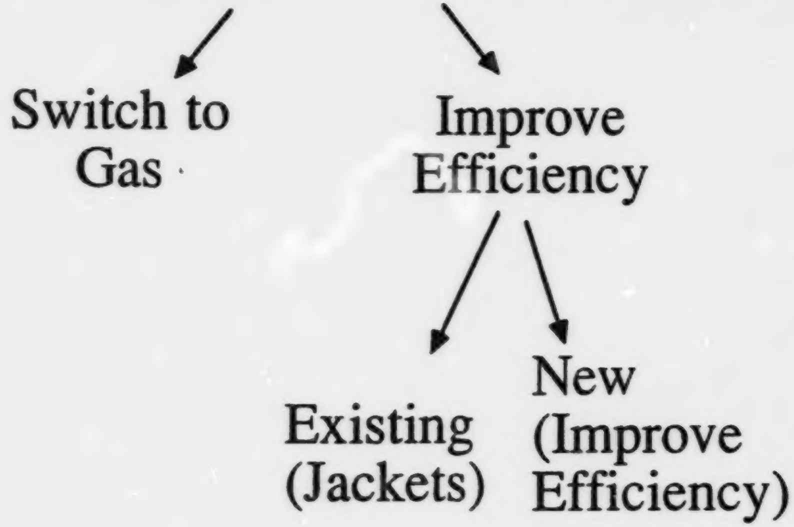
Water Heating

Current Situation

50% of BC uses Electric Water Heating

Exhibit 11

Electric Water Heating



Switch to Gas

Improve Efficiency

- Existing (Jackets)
- New (Improve Efficiency)

Exhibit 12

Water Heating
Strategy & Promotions

1986-87 Experiment in Remote Communities

1988 (Summer)
- Pilot in selected communities

- 1989-1992 Full Program

Exhibit 13

Benefits of Improving Water Heating Efficiency

To Customer:

- Lower operating cost

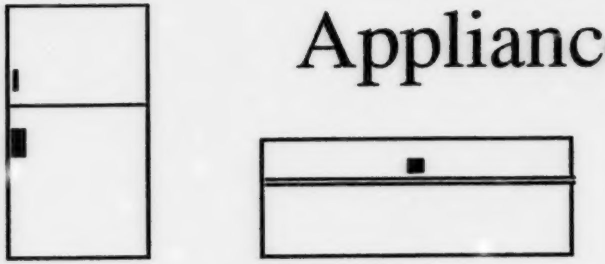
To Hydro:

- Each 20 efficient tanks saves enough energy for one home

- Total program has potential to save energy worth 70,000 homes

Exhibit 14

Appliances



Current Situation:

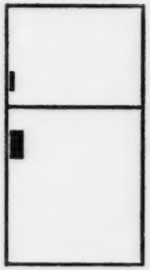
- 15% of B.C. Homes have 2 or more refrigerators
- Older refrigerators cost $100/yr to operate but more efficient models cost $75/yr to run

Objective

- To reduce the penetration of unnecessary second refrigerators in households
- To increase market saturation of efficient refrigerators & freezers.

Exhibit 15

Appliances
Program Strategy & Promotions



- Rebate for old fridge
- Local charity to pick-up
- Disposal of freon
- Rebate for most efficient new fridges

Exhibit 16

Appliance Benefits

To Customer:

- Lower Cost of Food Storage
- Greater Knowledge of Appliance's Efficiency

To Hydro:

- 4 New Fridges Run as Efficiently as 3 Older Models

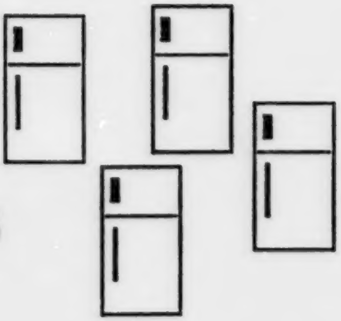


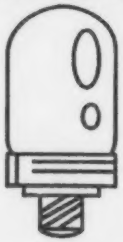
Exhibit 17

Lighting

Incandescent

A good idea in 1888

Fluorescent



A great idea in 1988

Current Situation

- Fluorescent lighting uses 1/3 the energy of incandescent lighting

- Compact fluorescent lighting has 10 times the life expectancy of incandescent

- However, only 10% of homes use any fluorescent lighting

Exhibit 18

Residential Lighting Program Strategy

- Labour saving especially multi-family
- Currently testing for acceptability
- Initial program for multi-program dwellings
- May expand to single family dwellings based on experimental results

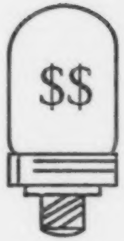


Exhibit 19

Lighting Benefits

To Customer:

- Labour Savings
- Cost Reductions
- No Reduction in Quality
- Higher illumination at less cost

To Hydro:

- 3 Energy Efficient Lamps Use Energy of 1 Incandescent Bulb

- Could save enough energy to provide 90,000 homes

Exhibit 20

DSM
Commercial
Programs

- Improve Future Building Design/Standards
- Retrofit Existing Buildings to Improve Efficiency
- Introduce Higher Efficiency Products such as Lighting Fixtures and Motors
- Improve Building System Controls

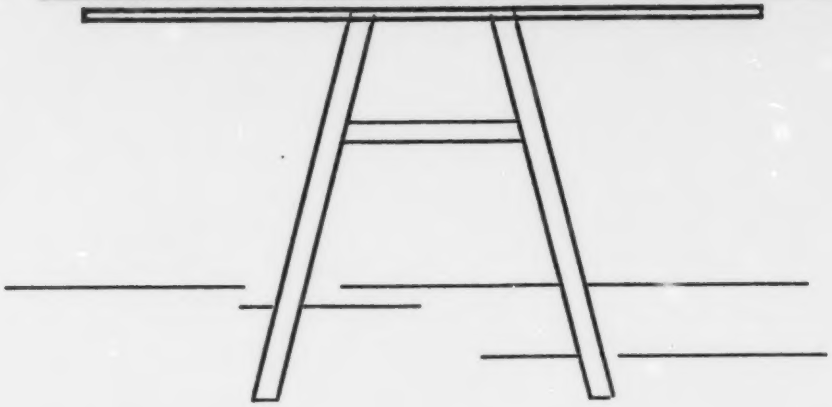


Exhibit 21

Commercial Uses Of Energy in B.C.

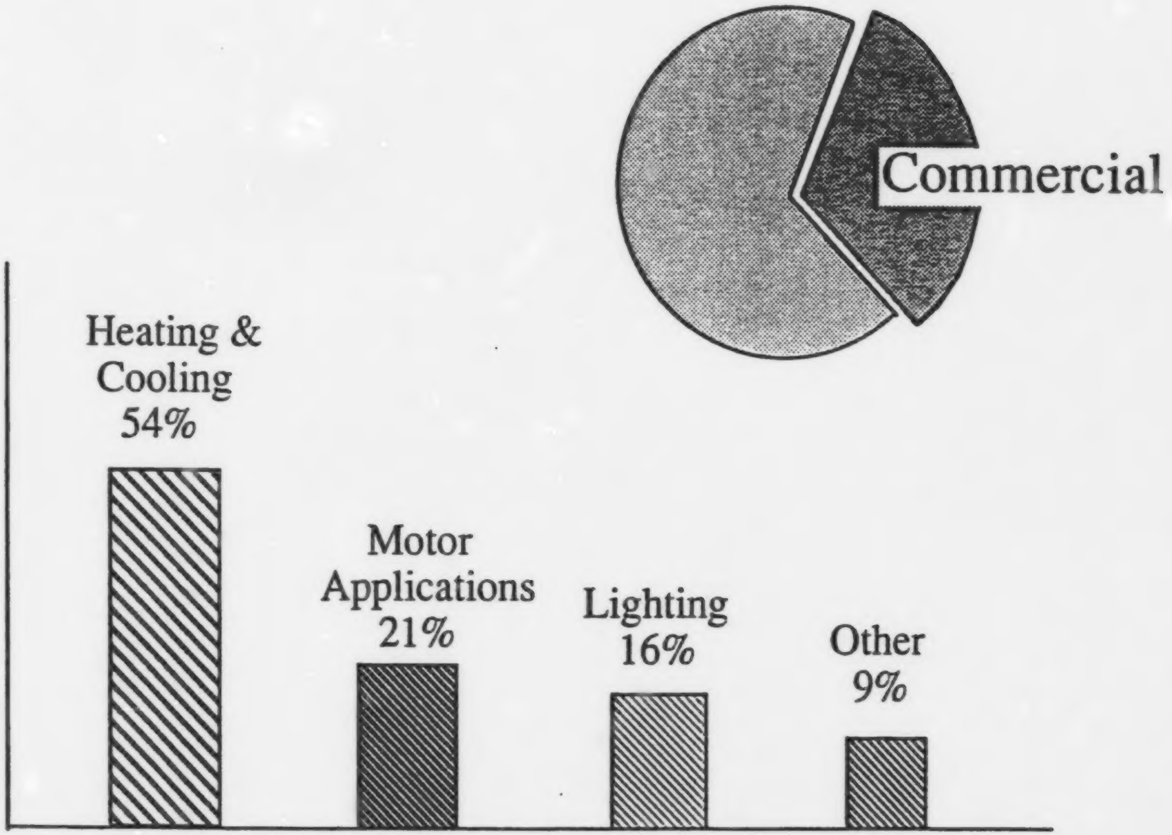


Exhibit 22

Energy Saving Fluorescent Lamps Program

Objective

- Encourage the use of 34 watt fluorescent lamps

Strategy:

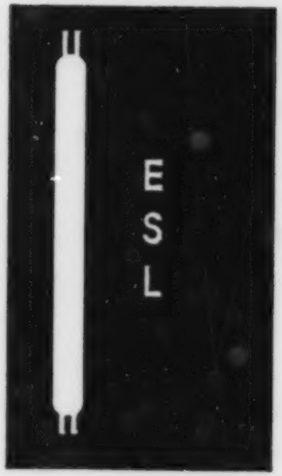
- Use advertising & promotion to raise awareness
- Provide rebate
- Use pilot to confirm program design

Impact:

- 20-year reduction: Enough energy for 280,000 homes

Exhibit 23

Energy Saving Fluorescent Lamps Program



Aims

1) **To maintain**

   customer's lifestyle but reducing energy use and cost

2) **To convert**

   90% of all existing fluorescent lighting to energy saving types by 1999

3) **20 million**

   4 ft. 40 watt lamps are replaced each year in British Columbia

4) **Program commences**

   Summer 1988

Exhibit 24

Energy Saving Fluorescent Lamps Program

Pilot Program

- Program delivery & handling system being tested in part of Lower Mainland (area of G.V.R.D.)
- Pilot benefits available to any B.C.Hydro customer who is prepared to replace 60 40 watt lamps with 34 watt energy saving lamps
- Target customers selected on basis of:
  - geographical location
  - energy consumption
  - type of business
- Rebate incentive being used -- based on 1986/87 data, 25 cent rebate covers average difference in price of one 34 watt energy saving lamp over price of the 40 watt

Exhibit 25

Energy Saving Fluorescent Lamps Program

GVRD
PILOT

Pilot Program (cont'd)

- Intent of pilot to roll over 200,000 lamps by end of March 1988

- For each lamp, with energy cost 5¢/kW.h and 3600 hours use per year -- annual reduction in electricity bill is $1.25

- Maximum rebate is limited to 2,160 lamps (72 cases), $540. Annual energy savings $2,700. 1st year 'savings' $3,240 less price of lamps.

- Customers being approached by:
  - direct mail (in up to 4 waves)
  - backup advertising
  - through copies of mailout by lamp manufacturers, maintenance companies and distributors

Exhibit 26

Electric Controls

Objective:

- Encourage installation & use of controls for electric systems

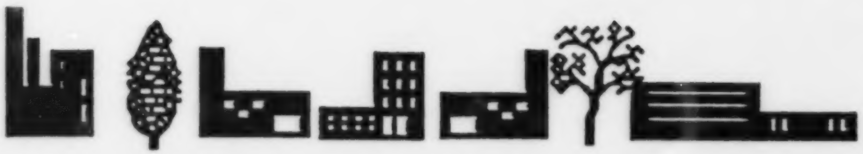
Strategy:

- Catalogue types & uses of controls
- Provide training, literature & education
- Develop demonstration projects
- Provide incentive or rebate

Impact:

- 20-year reduction is enough energy for 80,000 homes

Exhibit 27



Building Design
& Finance Assistance Program

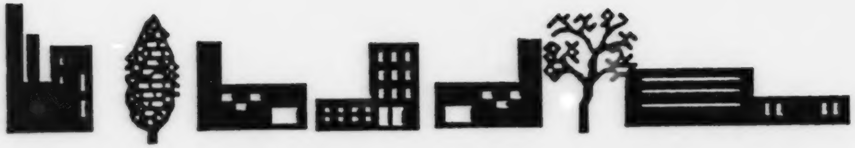
Objective:

To reduce electrical energy consumption in new commercial and institutional buildings.

Description:

10-year program which will offer technical and financial assistance in evaluating and installing energy-efficient design alternatives for new buildings.

Exhibit 28



Building Design
& Finance Assistance Program

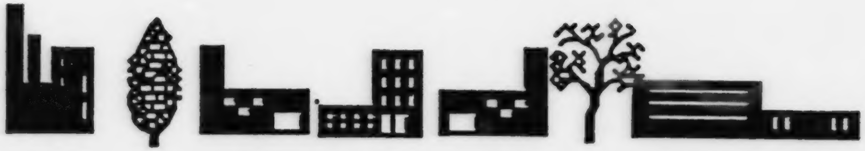
Proposed Program Strategy:
(Design Assistance)

- Base Energy Consumption Budget, or Prescriptive Standard
- Three level approach:
  (1) Small Buildings -
    - prescriptive measures

  (2) Medium Size Buildings -
    - bin temperature type computer simulation

  (3) Large Buildings -
    - hour by hour type computer simulation

Exhibit 29

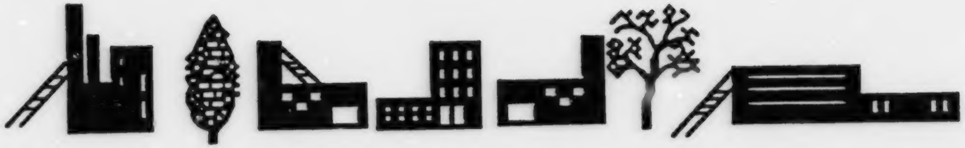


Building Design
& Finance Assistance Program

Proposed Program Strategy:
(Finance Assistance)

- Additional consulting fees
- Additional capital costs
- Awards/recognition
- Inspection & verification
- Energy consumption monitoring

Exhibit 30



Building Retrofit Program

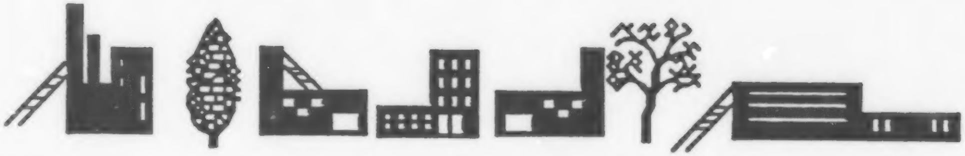
Objective:

To reduce electrical energy consumption in existing commercial & institutional buildings

Description:

Ten-year program which offers technical audit and retrofit incentives to all existing commercial & institutional customers in B.C.Hydro's service area

Exhibit 31

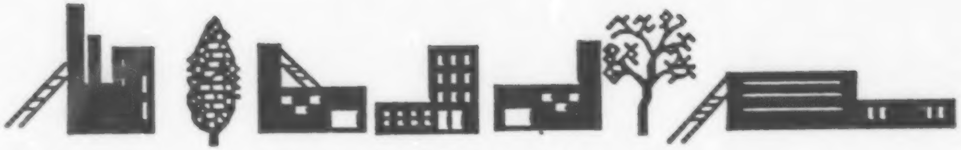


Building Retrofit Program

Proposed Program Strategy:
(Audit)

- Groups to perform audits:
    - building owners
    - energy services companies
    - manufacturers
    - consultants
    - B.C.Hydro
- Hydro will provide technical assistance - data sheets to the Industry

Exhibit 32

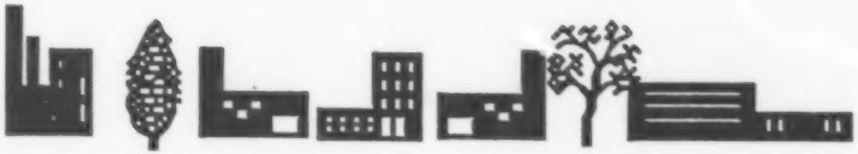


Building Retrofit Program

Proposed Program Strategy:
(Financial Incentive)

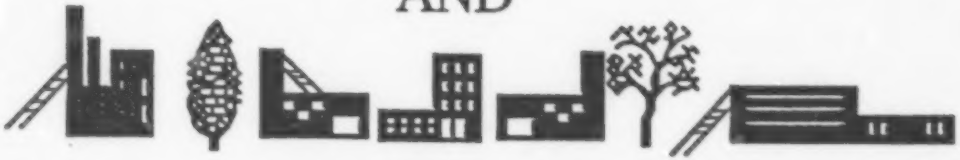
- Prioritize retrofit options
- Financing negotiation
- Inspection/Verification
- Monitoring

Exhibit 33



Building Design
& Finance Assistance Program

AND



Building Retrofit
Program

Pilot Projects:

- 1 commercial building for each program
- 1 institutional building for each program

Exhibit 34

RESIDENTIAL PROGRAMS

	Expected Load Reduction in 2007	20 Yr. Load Reduction (GW.h)
Residential Programs		
Gas Space Heating	115	820
Gas Hot Water Heating	130	2100
New Building Standards	100	850
Retrofit	115	1700
E+ - Strategic Conservation	60	780
Hot Water Jackets	0	600
Hot Water Efficiency	0	70
Refrigerator Buy-Back	40	700
Refrigerator Efficiency	55	730
Freezer Efficiency	10	80
Residential Lamp	170	900
Total	795	9,330
Commercial Programs		
ES Lamps	105	2800
ES Lamps & Reflectors	+115	1300
Incandescent	100	1100
Electric Control	75	800
Building Retrofit	580	4300
Building Design Incentive	340	2300
Total	1,315	12,600
Industrial Programs		
EE Motors & Drives	740	7300
Lighting	330	3300
Air Compressors	40	500
Audit	150	1500
New Plant	35	350
Total	1295	12,950

Exhibit 35

INDUSTRIAL DEMAND SIDE MANAGEMENT PROGRAMS

(PRE-PRINT)

G.D.A. HENRIQUES

Industrial Marketing Manager
CUSTOMER SERVICES
B. C. HYDRO

INDUSTRIAL DSM PROGRAMS

CONTENTS

Section	Subject	Page
1.0	INTRODUCTION	2 - 47
2.0	TECHNICAL CONSIDERATIONS	2 - 48
	(a) Electric Motors	2 - 48
	(b) Flow Control Applications	2 - 48
	(c) Lighting	2 - 49
	(d) Efficient Air Compressor Systems	2 - 50
3.0	PROGRAMS	
	(a) Energy Efficient Motors and Drives	2 - 50
	(b) Energy Efficient Industrial & Street Lighting	2 - 50
	(c) Energy Efficient Air Compressor Systems	2 - 51
	(d) Energy Audit Program for Industrial Plants	2 - 51
	(e) New Plant Energy Assessment Program	2 - 51
4.0	CONCLUDING REMARKS	2 - 52

1.0 INTRODUCTION

We at B. C. Hydro are committed to providing our customers with the technical assistance needed to use electricity as efficiently as is financially practical. Our team of energy management specialists monitor new electrical products and technologies, and the effects these have on electrical energy use. We examine the ways and means by which these products and technologies can be applied by our Industrial Customers and provide the support needed to speed up the adoption rates.

Industrial Customers are classified by the major products produced and last year accounted for 16 000 GW·h of electricity. To see where the energy has been used, look at this table with the proportions:

	(%)
Pulp & Paper	45.0
Mining & Metals	23.0
Chemicals, Petroleum & Coal	13.0
Wood Products	12.5
General Manufacturing	4.3
Food & Beverage	2.3

There are a large variety of ways in which electrical energy efficiency can be improved. We have looked at programs developed and implemented by other utilities in North America and have discussed some of these programs to see what we could learn from them to help us to design our programs. Let us look at how we arrived at our priorities by examining the distribution of industrial electricity use by application.

Approximately 14 600 GW·h or 91.3 percent of industrial load was used to power motor drives, 1000 GW·h or 6.9 percent for lighting and 400 GW·h 1.8 percent for heating applications.

Our Industrial DSM Goal is to help our customers to reduce electrical consumption by 1295 GW·h/a in the peak year of the program, almost 1/3 of the energy of the Peace Site C project.

2.0 TECHNICAL CONSIDERATIONS

To arrive at our priorities, we examined the technical factors that would show us how to reduce energy use along with the size of each end use segment.

From these, we deduced that motors and lighting should be explored further. Electric motors provide the driving force for refiners, grinders, crushers, conveyors, fans, pumps, and compressors and many other machines. It was clear that we should go beyond the efficiencies of the motors, to the entire systems that they drive.

The area of lighting energy use was another very important one because of the tremendous efficiency improvements that have been achieved with the high efficiency light sources.

(a) Electric Motors

Standard Electric Motors of the type used in Industry have efficiencies in the range of 74 percent to 92 percent. These are good conversion efficiencies when compared with fossil fuel fired engines. However, it has been established that by altering some factors in the design and construction of Electric Motors, efficiency improvements of the order of 2 to 10 percent can be achieved.

Energy Efficient Electric Motors have been designed to meet the same basic performance specifications as Standard Efficiency Motors except that design changes have been incorporated to reduce the losses by about 50 percent. These design changes include a better quality silicon steel core, thinner laminations that form the core and more of these laminations. The result is a longer stator and rotor core. In addition, the conductor sizes have been increased to reduce the conductor losses. The Energy Efficient Motors are built to improved quality control standards and are reputed to last longer than standard designs because they run cooler. These high quality motors cost more to purchase, but in many cases the premium costs can be recovered in 1 to 5 years depending on operating hours and the price paid.

Here is an example that demonstrates the magnitude of savings and the payback.

> In a plant built in Canada recently all of the 600 volt motors installed were of the Energy Efficient design.
>
> For the 430 motors installed, the power saving achieved was 200 kW, valued at $30,000/year for an extra expense of $48,000, thus giving a simple payback of 1.6 years.

(b) Flow Control Applications

Industrial Electricity Use includes the energy Used for fans, pumps and compressors. We see that pumps use about 25 percent of the electricity used in Industry, fans 14 percent, and compressors use 13 percent.

Fans are often controlled by damper systems and pumps by throttle control.

Higher efficiency can be achieved by using the adjustable speed drive system during low flow conditions in place of a pipeline pump controlled by a throttle valve.

Adjustable Speed or Variable Frequency Drives or Inverter Drives, as they are sometimes called, are solid state power supplies used to operate 3-phase, squirrel cage, induction motors. These drives take the standard 60 Hz, 3-phase AC power supply and reconstruct a 3-phase variable frequency power supply. Since the speed of an AC motor depends on the frequency of the power supply and the number of magnetic poles in the machine, by varying the frequency the speed of the machine can be varied.

The ability to vary the speed using solid state components results in a tremendous improvement in the efficiency of operation. These drives are used for fans, pumps and conveyors where variable flow rates are required. Efficiency improvements in the order of 20 percent to 50 percent are practical. These drives are beginning to gain acceptance in some industries, but there is a general lack of understanding of their value. They tend to be purchased for process control benefits and the energy savings are a bonus.

In the case of adjustable speed drives, the potential savings for each application is significantly larger than for motors as shown in the following examples:

> For a 140 kW Boiler Feedwater Pump; the adjustable speed drive option would result in 47 percent savings or $15,000 per year. The incremental cost for the equipment would be recovered in 2.2 years for a new installation and in 2.6 years for a retrofit.
>
> For a 575 kW Boiler Induced Draft Fan, the adjustable speed option would result in 38 percent savings or $33,000 per year. The incremental cost for the equipment would be recovered in 2.7 years for a new installation and 4.1 years for a retrofit.

(c) Lighting

High efficiency light sources such as metal halide and high pressure sodium reduce energy costs by up to 50 percent because of the higher lumen output per watt compared with mercury vapour lighting, the industrial standard for many decades.

The new high pressure sodium lighting which has a warm glow compared with the white light produced by mercury vapour.

(d) Efficient Air Compressor Systems

Compressed air electrical energy use in our service area has been estimated at about 750 GW·h/a. Of this amount, 10 percent could be saved by the elimination of system leaks and another 10 percent could be saved by improving control strategy and control and distribution and storage systems.

3.0 PROGRAMS

Analysis of the technical considerations has lead to the identification of the following Industrial DSM Programs:

Energy Efficient Electric Motors
Adjustable Speed Drives
Energy Efficient Industrial & Street Lighting
Efficient Air Compressor Systems
Energy Audits
New Plant Energy Efficiency Assessment

(a) Energy Efficient Motors and Drives

The objective of these programs is to reduce electrical energy use by 740 GW·h/a. The strategy proposed is to promote an awareness of the applications where energy efficient motors and drives will be financially beneficial. Promotion will be by means of seminars and workshops and during our normal contacts with our customers. A spread sheet analysis program is available to calculate savings and paybacks and a version for personal computers will be made available to customers, consultants, and distributors. A pilot program that is under development will determine what action we should take to achieve this target.

A recent study for the Canadian Electrical Association concludes that normal market forces will increase the market penetration of Energy Efficient motors from the present level of 5 percent to 20 percent over the next 20 years. The report also asserts that by using financial incentives a market penetration of up to 75 percent is possible. Over the next 20 years the motor and drive programs are expected to release 7300 GW·h of electricity (accumulated).

(b) Energy Efficient Industrial & Street Lighting

The objective of these programs is to reduce electrical energy use by 330 GW·h/a. The strategy is to provide technical literature and seminars to raise the awareness of the benefits of high efficiency light-sources and to provide customers with technical and promotional information in a similar manner to the motor and drive programs. These programs will promote the use of high pressure sodium, and metal halide sources for industrial lighting, and high pressure sodium for street lighting. Over the next 20 years these lighting programs should release 3300 GW·h of electricity (accumulated).

(c) Energy Efficient Air Compressor Systems

This program is designed to reduce electrical energy use by a minimum of 40 GW·h/a. The strategy will be similar to the previous programs, but in addition we propose to offer a leak testing and evaluation service which will identify the energy being used to supply leaks, the value and also recommended changes to improve the system. A followup test will be conducted 6 months later and those who have reduced these leaks to an acceptable level will receive appropriate recognition. The target set for this program is conservative and realistic. It should release more than 500 GW·h over 20 years (accumulated).

(d) Energy Audit Program for Industrial Plants

This program is designed to reduce electrical energy use by 150 GW·h/a. In existing manufacturing facilities there are often many opportunities for improving energy efficiency. In fact the energy efficiency of B. C. companies is considerably lower than our international competition. The main reason is that energy efficiency has not been given a high priority because of our historically low energy costs. However, if energy costs are to remain low, energy efficiency will have to be given a higher priority.

To encourage industrial customers to make modifications which would result in energy efficiency improvements, a program involving engineering studies of industrial plants will be developed to assess their present energy use and to determine alternatives available for efficiency improvement. Hydro would develop a procedure in conjunction with consultants for performing these studies. The engineering studies would concentrate on areas where process efficiency and energy utilization would be improved at the same time (e.g. adjustable speed drives for process control). The 20-year impact of this program is estimated at 1500 GW·h.

(e) New Plant Energy Assessment Program

We expect this program to reduce electrical energy use for new plants by 35 GW·h/a. We believe that the energy consumption in manufacturing plants could be reduced if energy efficiency was given a higher priority during the design and construction phase of new plants.

The objective of this program is to assist prospective customers in increasing the energy efficiency of their new manufacturing facilities. The program strategy is to increase executives' awareness of the financial benefits of improved energy efficiency during the design of new plants.

It involves establishing a set of Energy Assessment Guidelines to assist design engineers in reviewing/assessing the efficiency of each process from an energy cost perspective. The consultant retained by Hydro, would prepare a report estimating the energy cost implications of key design decisions (e.g. the financial value of higher efficiency pump and fan systems), and this would be discussed with key executives in the company.

The Customer would obtain a better appreciation of future energy costs and the options available to reduce these costs.

It is anticipated that this evaluation will provide the necessary information to help our customers make improved energy efficiency related decisions and result in accumulated energy use reductions of the order of 350 GW·h.

4.0 CONCLUDING REMARKS

B. C. Hydro provides technical information bulletins or data sheets through all of our customer service offices. We promote energy-efficient technologies and products such as you have seen described.

We provide technical guidelines for energy efficiency improvements for all our customers. Our Data Book Service is available to all of our customers, trade groups, consultants and other interested parties.

We sponsor seminars with our trade and technical association allies throughout the province and for large customers we provide the service of our Energy Use Demonstration Vehicle, a Mobile Energy Advice Centre in which new products and technologies are demonstrated.

To help us collect your input on this subject, we invite your comments and suggestions. We have included a questionnaire on Demand Side Management in the registration folder. We would appreciate it if you would spend a few minutes to provide your comments and suggestions and we are open to discussing your thoughts on this topic during the next two days.

Questions

Fred Corcoran for Noranda Mines

One question and one observation. What happens to a high efficiency motor when it is rewound? The other is the observation on the drives where you mentioned a 38 percent saving. Usually your average squirrel cage motor will run ten or fifteen years with very little trouble. It is just a cheap and dirty device. It does not give you problems, but when you get a drive the additional maintenance that the drive is going to take is going to have to be added to that, and therefore, is going to be subtracted from your 38 percent efficiency.

Derek Henriques

In answer to your first question, can energy efficient motors or high efficiency motors be rewound, or what happens to them when they are rewound? Yes, they can be rewound and they can be rewound as efficiently as they were built originally. This involves a bit more care in the rewind process than was typical five or ten years ago. It is important that the temperature of the core not be raised above a critical level of say 750 degrees Fahrenheit when you are removing the wiring, and in fact some of the shops that rewind high efficiency motors take no chances at all, they saw off the ends of the windings and pull them out physically rather than heat up the entire motor. They bake it similar to a self-cleaning oven to remove the insulation from the copper. As for the second question, I talked to the Electrical Appliance Service Association about three weeks ago and we discussed this particular topic with about 30 or 40 of the largest rewind shops in B. C.

You are suggesting that solid state adjustable speed drives have high maintenance costs. I do not think that the maintenance costs are a significant portion of the large savings that we were talking about. In fact, the new high efficiency adjustable speed drives that are available today are very reliable. There may be a perception that some of the earlier drives were not reliable and that is true, the earlier ones were not reliable because there were bugs. In any new product there are always bugs. The bugs were commonly in the adjustable speed drive. It is a complicated device which requires technical maintenance, but I am not sure that I have heard any reports that the costs are that significant to make a huge difference to your pay back. If you have paid for your device in two years, then all of those savings available after that should more than offset your maintenance costs.

Floyd Lundstrom, B. C. Forest Products

I do not know whether I want to ask you a question, so maybe I will give you an answer. First of all my experience with the high frequency drives, variable frequency drives or variable speed drives is that they are very, very reliable. The question I want answered is, are you prepared to assist this industry in converting to these types of drives or are you just saying that it is worthwhile to do so without any assistance, because as you know it is reasonably expensive to do the conversion.

Derek Henriques

I appreciate your comment about the reliability of those drives and I also appreciate that some applications are not as cost effective as others. I have given you examples where they are cost effective. I would say that we would have to sit down together and discuss the implications of retrofitting your drives and to identify the type of pay back there is for you and, if necessary, we are prepared to consider certain incentives. I cannot say right now what they are or how much, but you will be the ultimate beneficiary and so will we eventually, and so there should be some area for negotiation there.

Unidentified Speaker

In your presentation were you referring to adjustable speed drives?

Derek Henriques

Are you referring to adjustable speed drives? Yes, I did not actually comment on the adjustable speed drives penetration rate. I understand from the suppliers that the sales figures are rising rapidly now, in new construction, but obviously in the retrofit cases they are not as economical.

THE POTENTIAL FOR ENERGY EFFICIENCY

(EDITED TRANSCRIPTION)

AMORY LOVINS

Director
ROCKY MOUNTAIN INSTITUTE
Snowmass, Colorado

I have been meddling, as Ralph would say, in Canadian energy policy for about 15 years. However, I first started to realize what exciting things were happening in Hydro when I had the honour to be a Grauer guest lecturer at U.B.C. nine years ago. For those who have not been following the good work of your dedicated people, their thoughtfulness and ability is very impressive. They must feel like an astronomer who just sees a super-nova coming into the sky! Of course, the process that leads to these innovative programs has been building for a long time and it reflects great credit on Hydro and on all who have contributed to that development.

I have come with good news and better news about your programs. The good news is we see here the prominent emergence of Canadian leadership in implementing a wide range of efficiency programs. That is not to say there are not good things going on in other hydros and some municipalities, but this is the most coherent set of forward-looking programs that I have seen actually getting out of the study stage. The better news is that there are very exciting developments in both technology and delivery methods that will make it easier to achieve and to far exceed your targets. To give you an idea of how quickly those developments are proceeding I can only say that most of the best electricity-saving technologies on the market today did not exist a year ago or at least were not available. We can now save about twice as much electricity as we could five years ago, and at only a third of the real cost. That is roughly a six-fold improvement in cost-effectiveness. Five years ago it was fairly easy to show that most kinds of electric savings would compete with the marginal cost of building and running a thermal plant,

Today there is very strong evidence that many kinds of electric savings are cheaper than operating an existing thermal plant, even if building it costs nothing. Some important kinds of savings are cheaper than operating existing hydro capacity, a rather unfamiliar concept. In fact, the many kinds of savings that I will describe have negative costs to society. The logic of acquiring efficiency resources goes further than simply demand forecast and physical need (i.e. how much do we need to build to keep the lights on). You can also have economic need for resources. That means that you should buy any power resource which will reduce the cost of providing electrical services. This is true even if you have over-capacity which represents a sunk cost. However, if you can still save the marginal variable cost you should do so, regardless of how much capacity you have, according to the logic of economic dispatch.

Of course, in the United States and in the Maritimes, we have long standing proof of this thesis. Recall the "oil backout" in the 1970s when many utilities in North America and throughout the world built capacity they did not need in order to replace expensive oil-fired generation. The principle was that it would be cheaper to build and run the new plants than to run the old oil-fired plants. I am saying that the same logic applies today to operating a lot of existing capacity, even including some hydro capacity. I will describe how to build a cheaper dam at less financial risk -- a modular, flexible dam with all the good properties that Ralph described earlier.

I should start by being concrete so I will start with lights. I do not know exactly what the end use structure is for your territory. I was a little surprised, if I heard it correctly, that only 16% of your commercial electricity goes directly to lighting. I would be interested to know how carefully that has been checked because that would be, by almost a factor of two, much lower than most other figures in comparable climates. I realize you have more electric heat in the commercial sector, but you also have commercial cooling, and much of that must take away the heat of the lights in large buildings. We find in the U. S. that about a quarter of all our electricity goes directly and indirectly to lighting. In other words when we count the lighting and its contribution to space cooling and air handling, then we subtract its contribution to useful space heat in electrically heated buildings during the heating season. We then end up with about a quarter of all our electric use. Now I am prepared to believe that fraction may be smaller in this province, but I do not think it is a great deal smaller.

To describe what to do with lights I should start with the things we see in the ceiling of this hotel. All of these little fixtures are cash cows waiting to be milked. The way you do that is to replace incandescent lamps with compact fluorescents. There are other kinds of substitutions and improvements as well, but I will just start with that one. The traditional kind of compact fluorescent is like the ones that Zak showed you earlier. The integral compact fluorescent lasts for about 10,000 hours and then you have to throw away the whole thing when the tube burns out.

In addition to the more traditional cylinder and globe shapes with reflective collars and other accessories, they also come in many other shapes and sizes. This is a more expensive and more efficient German version, the instant start one that Zak referred to. You see it is rather compact. It comes in four sizes that fit practically anything and Phillips has a variety of other shapes and sizes including this rather nice 18 watt reflector. Excuse me if I dazzle you momentarily, but I would like you to see that 18 watts is equivalent to about 75 in this case. Of course, these save money in lamps and trips up a ladder. Because of their 10,000 hour life, they more than pay for their high front-end cost. Generally, for compact fluorescent lamps the avoided maintenance cost to the customer more than pays for the extra cost of the lamp. Therefore, the electric saving is better than free. This is not a free lunch, this is a lunch you were paid to eat.

The other kind of compact fluorescent, which to my mind is even more exciting, is the modular kind. You see I have a ballast adaptor and a lamp which comes in various sizes and if I put this on I now have an 8½ watt pressed aluminum reflector lamp which replaces a 75. If I prefer, I can make it into any of 15 kinds of decoratives for restaurants, cut glass globes or whatever else you want. These come in different colour temperatures including some that nicely mimic incandescent. Unlike normal fluorescent lamps in offices these have 82% to 88% perfect colour rendering. It is a much more attractive colour than traditional fluorescents and it is also a more efficient phosphor.

The next generation of adapter, like this Swiss one which takes six different sizes of compact fluorescent lamps for your convenience, is a light weight high frequency electronic ballast that is about a third more efficient and also eliminates flicker and hum. These come in many other shapes and sizes; for example, here is a 13 watt quad tube inside a reflector. It puts out about the beam candle power of a 120 watt flood. Then what you replace every 10,000 hours is not the whole assembly but only the little plug in lamp which is a few bucks. This is about minus 11¢ per kilowatt hour saved, this about minus 8¢ and so on. That is how you can beat Hydro in the merit order.

In the United States about 42% of all lighting energy is incandescent, and about 45% of the commercial lighting energy is incandescent. Notice that is in kilowatt hour terms not in light terms because incandescents are less efficient. A 45% share of commercial lighting energy means only about 17% of the light delivered in the commercial sector comes from incandescent lamps. When you remember that the commercial sector includes buildings like this one and restaurants, it is really quite a reasonable figure.

Roughly another 50% of U. S. lighting energy, I expect it may not be too different in Canada, is fluorescent lighting. One can use several other kinds of technologies that are even more powerful. In the first one, you take a building like this and put a reflector made of an extremely shiny material in each fixture above the lamps that, by computer design, is bent into a special shape. That shape is so optically precise that it roughly doubles the efficiency of the fixture. Not only is it a shiny material, but it is bent just so, in a way that is designed for each application. The result is you can take out half the lamps in the fixture and still get the same amount of light underneath. In a building like the one you just saw, each removed lamp represented on the order of $20 odd Canadian a year in avoided operating cost. That is a lot of 20 bucks.

These special reflectors generally require you, if they are well designed, to move the remaining lamps into optimal new positions. While you are moving them around it is advantageous to replace them with lamps that have a different phosphor; ones that give better colour and are about 17% more efficient. You may also need to move the ballast around. In that case, there is very little extra labour cost associated with changing to a high frequency electronic ballast, in this case one that controls four F-40 lamps rather than two. If you imagine you have two adjacent four-lamp troffers, four foot long lamps, you put in the reflectors, and now you have two lamps each and you share a ballast among all four. You now have half as many lamps and a quarter as many ballasts as you started with. The reduced maintenance cost on that assembly cuts the present valued capital cost by about two-fifths. You end up saving about four-fifths of the electricity at a cost of about ½¢ Canadian per kilowatt hour.

Here is an experiment we did in the cloudy climate of Green Bay, Wisconsin where a utility was about to move into a new office space. It started with efficient louvered three lamp fixtures and high efficiency electromagnetic ballasts. This is typical of a very good new installation. (By the way, if you start with this or with a standard 20 year old troffer it will make a difference of only 1% or 2% in how much you save. We can go into why later.) The first thing we did was put in a reflector. We went from three to two lamps and we had a measured reduction in watts per delivered lumen of 33%. Then while we were moving the lamps around we changed them to a much better phosphor, saving another 11%, cumulative 40%. We now have better lamps than that. Then we put in a high frequency ballast about half as good as those on the market now (this is a two year old experiment) saving another 11%, cumulative 47%.

We then activated the automatic dimming feature of the electronic ballast saving another 48%, cumulative 72%. (By the way, one of the reasons that I think it may be preferable to use 40 watt lamps if you are going to go in this direction is that they deep dim nicely. The 34 watt lamps are Krypton-filled and do not dim that well.) The measured cumulative saving, if you average the last two of these figures, gives you a good surrogate for the average of perimeter and core zones of a big building, that is about 60%. But if we had started with standard electromagnetic ballasts instead of the more efficient rather scarce ones, that would have been 64%. Next we observe that these electronic ballasts are a kind of electronic wonder bread. They save electricity nine ways not just the several I have counted so far.

If we count other people's careful measurements of some of the other savings mechanisms, we save an extra third which increases the average saving to 76%. Test-tuning means that you can adjust each ballast to get just the amount of light you want in that part of the room -- more over your desk, less in the corridor or off in the corner. Automatic compensation for lumen depreciation means that the same photo cell controller which dims the lamps according to how much light is coming in through the window will also brighten them as they dim with age so that you do not need to over light when they are young and fresh in order to get enough at the end of their lives. Improved voltage and temperature stability means you do not need to over design so much in order to account for off specification lamps, wall temperature and supply voltage. If we use the particular ballast I held up, which was not so well characterized when we first did the experiment, but now there are several different independent measurements of it, we find it saves about twice as much as the one we did use. You are up to 82%.

Notice we have not counted yet occupancy sensors, infrared or ultrasonic gadgets to turn off the lights five minutes after the last person leaves the room. We have not counted reducing ambient over-lighting and putting more light where you want it. That is especially important in modern offices where you do not want too much light so you can read your computer screen. We have not counted the option of replacing the lens at the bottom of the troffer with a polarizing material which eliminates glare off what you are trying to read, so that the light becomes about twice as visually effective, and that way you can see as well with half as much light. We have not tried white paint or light coloured carpets or better furnishings and fixtures to bounce the light around better within the space. We have not tried measures like top silver blinds to bounce light around within the room and deeper into cavities. We certainly have not tried the newer and more exciting passive lighting methods.

For example, there is a Vancouver firm, I believe TIR Systems, which uses this 3M Scotch lamp material to make light pipes, with total internal reflection. You feed daylight in one end, supplementary dimmed high efficiency artificial light in the other end, and you run this pipe along the ceiling. When you want the light to come out you stick on an extractor film, the light sprays out. That is your fixture. Same for both the natural and the artificial lights so there is no duplication. We certainly have not counted that sort of thing or fiber optic lighting, another interesting option. Of course, we have not counted the fact that in large buildings you are likely to get a net saving on net HVAC effects. So we are still getting roughly quintuple the efficiency without counting those half dozen or more other options plus others I did not bother to list.

My colleagues and I have just published a 348 page encyclopedia, which documents from measured cost and performance data, the full practical potential in the United States to deliver the same amount of light we get now (only it would be more attractive and more visually effective light than now) using 8% as much electricity as we now use for lighting. In other words a 92% saving. The average cost of those savings works out to 14 mills U. S. That is about 120 gigawatt U. S. potential. You can think of this as 60 Chernobyls in U. S. potential and you can think of these as about 50 Chernobyls all at negative costs for some, and about four mills for others.

The whole commercial sector is the biggest gold mine in the economy. Just for fun, let us pick a place with a hot, humid climate, because that is much tougher than the climate you have here. In other words, it costs you more to save less in a hot, humid climate than in Vancouver. I will pick Austin, Texas. In Austin, (you will find the numbers different here but not enormously so) the lighting plus its net HVAC effect is good for about half the total savings in the commercial sector. More importantly, the lighting has a negative net cost made up mainly of two elements. That just about pays for everything else. Those of you that have analysed commercial retrofits will see some old friends: variable air volume ventilation, chiller modulators, supermarket retrofits, anti-gain window films, high efficiency chillers, and some little things like high efficiency motors and adjustable speed drives.

However, the economics are a lot more favourable when you count everything than when you just count mechanical items like these. When you take credit for your ability to save more money downsizing the replacement chiller and you have reduced internal and external heat gains, then it costs you extra to make the new chiller almost twice as efficient. So, instead of almost 3¢ a kilowatt hour, that cost becomes slightly negative, whereupon the average cost of saving roughly three quarters of the electricity in the sector drops to about three hundredths of a U. S. cent per kilowatt hour. That is when we assumed that only a quarter of commercial lighting energy was incandescent. We now know it is almost twice that.

Therefore, this negative cost gets so heavily weighted that if I were doing this today, instead of a year and a half ago, I would have to say that it costs about minus seven mills a kilowatt hour on average. Even if you do not count the operating and maintenance saving to the customers from less equipment, or equipment that lasts longer, the cost of giving away all this and installing it for free is still less than 1¢ a kilowatt hour compared to the roughly 5¢ or 6¢/kW.h delivered marginal cost that we were shown for Hydro's possible supply expansions.

Here is the proof of the pudding for actual new commercial buildings in a variety of climates. I pulled together some estimates showing not just the electric, but the total energy use on site. For the average office in the U. S. it is about this much, excuse the barbaric units, but just compare the numbers. Whereas, the California title 24 building code cuts that by almost two-thirds. There are 100 odd efficient offices that have been carefully monitored; they cut it by half. Here are some examples of others, mainly office buildings, of which our own is down at the bottom here, showing what is perfectly feasible without using a lot of the advanced technologies I have just mentioned. As we heard earlier, the extra hard cost of constructing most of these improvements turns out to be negative because you save more money downsizing mechanicals than it costs you extra to put in better lights and glazings and so on.

I did not count in that last analysis an important technology, especially for the residential sector, and that is advanced glazings. Here is a U-value 1.05 window. In other words, it insulates twice as well as triple glazing. This happens to be an argon filled heat mirror. A heat mirror is an infrared reflecting, but visually transparent film suspended in the middle, where you cannot see it. This is what heats our house, which I will describe more about later. You can now make windows twice this good and with your prices and your climate they would still pay back in approximately three or four years. In our house they have a negative marginal cost, because we save more by eliminating the furnace than it costs us extra to super insulate and get such good windows.

The Rocky Mountain Institute headquarters is a 400 square metre building at 2,400 metres in the Rockies. I expect the climate may be more comparable to some of your central locations. The temperature drops to -44° Celsius and we have 4,900 Celsius degree days a year. The building has no furnace and it uses considerably less than 1% the normal amount of heat. We have a number of clear stories to get heat and light in the back of the building. Two of the assemblies are active solar, one for hot water and one is a passive down pumping thermal syphon for a hot tub. We also have a large greenhouse, and we have a couple of wood stoves which are very rarely used. If we used them a lot we would roast. In a very bad winter, for example our first winter, when we had 39 continuous days of cold, cloud and snow, we might burn as much as half a cord of soft wood for 400 square metres. A good chunk of that is for esthetics rather than for backup. We also have a portable supplementary space heater of about 50 watts but adjustable to about 100 watts.

In the middle of our house which is connected to the headquarters to give us a 30%-40% safety margin for those long cloudy periods there is a 90 square metre greenhouse, which is a semi-tropical growing space all year around. It is very good for avocadoes, papayas and bananas. We were sprouting stuff in two days at New Years in a recent winter. In the background are a refrigerator and freezer which use respectively 8% and 15% of the normal amount of electricity. Our lighting density is one or two-tenths of a watt per square metre and that is with efficient equipment and +95% day lighting. Our total light and appliance bill at 71 mill rates runs about $5 U. S. a month. That is for all the household uses.

Down at the other end of the building we have a 34 person research centre. That is where the electric bill goes up by about $30 a month. We have to run seven computers, two photocopiers and two laser printers, almost the entire electric consumption of the building. The total electric load averages two watts per square metre. Somebody said our architecture is equal to Elizabethan. Well, the extra cost of saving +99% of the heat, 90% of the electricity and half the water was about $12,000. We saved half up front by not needing a heating system and duct work. Therefore, our net extra cost was about $6,000 U. S. or $1.50 U. S. per square foot, or $16 per square metre. The pay-back compared with normal local building practice is ten months. We think of this building as a barrel-a-day stripper well producing $19 per day worth of saved energy, and having paid for itself in the first year, those savings will go on to pay off the entire building in about 40 years using five year old technology. We could do better now.

To give another example, let us look at two stages of a retrofit of a standard single family house in Austin, in July, which is surprisingly similar to what you can get in a cold climate in January. The economics are surprisingly similar as well, because most of the cost of these two retrofit packages is for shell measures, better insulation and better windows. The things that you use to avoid cooling load in Austin are the same measures that you use to avoid a heating load in a cool climate. The results are strikingly similar.

Part of the reason retrofits are so cheap is that we are combining expensive shell measures with cheap appliance efficiency improvements. We have, for example, just by choosing better colour televisions the next time we buy one, the ability to cut load from roughly a 150 watts to roughly 40 watts. There are striking advances in many conventional kinds of household appliances. We are going into production now on a de-humidifying heat pump clothes dryer and there is talk of microwave clothes dryers. There are advances in electric cooking equipment, including double walled cooking pots. The list goes on. I just ran a quick calculation that if some of the best technologies on the market for household use were applied to retrofit a typical house in the B. C Hydro stock right now you would end up saving well over 70% of its electric use.

There was a good question earlier about industrial applications, the second biggest gold mine after commercial lighting. In the second quarter, we will be doing a comparable report on drive power. My best estimate from the 14 or so classes of measures we are looking at for motors is that motor controls and drive trains can collectively save roughly half the drive power at an average cost of three to five U. S. mills per kilowatt hour. That comes partly out of an exercise I did on a pulp and paper mill in Maine several years ago. I think from our subsequent work, the actual savings may well be larger than this. The pulp and paper company was burning a lot of oil rather inefficiently, some purchased from the utility and some in its old condensing plant. The utility wanted, instead, to build a hydro dam which would supply the same amount of electricity at a lower cost. So far so good. However, we found that they could save roughly one to two times that much electricity at no more than one-eighth of the cost by improving some electric uses in their mills.

For example, there is a category of technology we have not heard mentioned and made by a little company in Iowa. For lack of a better name I call it a "fast controller". It is a very sophisticated micro-processor control for compressors, and it can also be used for centrifugal or axial pumps, blowers and fans. In other words, most of the major industrial loads. It operates turbo machinery just to the edge of its stability and below, for optimal efficiency, without crossing over into the domain of compressor, surge or pump cavitation. This greatly reduces down time on the equipment which is worth a lot more than the energy savings. The energy savings in large compressors for example are typically 20%-25% with a one year payback, and the machine does other useful things like optimally dispatching parallel compressors. That saving is quite independent of the other savings achieved by adjustable speed drives, high efficiency motors and power factor controllers for variable load applications. There are some other potentially large terms, for example, correcting bad house keeping like minor phase imbalances or power factor that is not properly corrected at the motor or poor maintenance or lubrication or cleaning practices or, simply, obsolete drive train equipment.

Here is a little model of a new kind of gear reduction. It is 95% or 96% efficient compared with a normal worm gear which may be 40% or 50% efficient. A big question mark is the quality of past rewinds. People in industry suspect that many of the rewinds done in the past, when we did not know so much about not overheating the core, may have been bad enough that the motor we think is 90% efficient may actually be 70% efficient or worse. Unless we do certain tests which are seldom done we will not actually know, partly because the motor may be so grossly oversized it can tolerate the inefficiency without burning the insulation. So when you replace an old motor, that may have been badly rewound or may be oversized, with a high efficiency motor that is a great opportunity to get rid of those other defects and at the same time make it optimal for working together with an adjustable speed drive.

There is a U. S. potential of roughly seventy gigawatts, at a few mills. If you add up our best data on the potential for saving U. S. electricity you get something like this. If you take the supply curves we are deriving for each end use, condense them to a point, and do a weighted average, you end up saving close to three quarters of all U. S. electric use at a price under a cent, probably closer to half a cent per kilowatt hour. The present uncertainty in these numbers is roughly ten percentage points on the quantity, and a factor of two on the cost. Those uncertainties are rapidly narrowing as we finish up the drive power and other analyses. It is an enormous resource. I could be wrong by a factor of two or three and still make a perfectly adequate point for purposes of this discussion, although I do not think these numbers are wrong by more than what I indicated because they are based on measured cost and performance data. For those of you who would like to find out more, my colleagues and I prepared a quarterly update service on the subject.

To give you more confidence in the costs I have mentioned here are some numbers on what some typical west coast utility efficiency programs did cost around 1985. Not all programs of course cost the utility less than a cent per kilowatt hour, (these are U. S. cents). But I have taken those that did for illustration. For example, for the four investor-owned utilities in California, the average cost of commercial and industrial hardware incentives was three quarters of a U. S. cent. The average cost of wrapping a water heater for Puget Power was a third of a cent rather than a couple of cents, as might be supposed. The average investor-owned utility paid a third of a cent per kilowatt hour for all programs to save electricity in the commercial, industrial, and agricultural sectors, and Southern California Edison which had the most mature programs did the same thing for an eighth of a cent per kilowatt hour. All of its commercial and industrial hardware incentives average

0.18¢. In fact, Southern California Edison, PG&E, Texas Utilities, some of our largest utilities that have been doing this for the longest time, report that their real program cost per kilowatt hour, or per peak kilowatt saved, is still going down and has been for some years because more streamlined program design and better technology is keeping pace with the exhaustion of the cheapest opportunities.

That brings me to how we can actually deliver the hardware to the customers. There are other rapid and exciting advances in implementation methods as well as there is in the hardware. Let me summarize some of the new developments in implementation.

The methods that are traditionally used include information to the general public or to particular groups like builders and design professionals, low or no interest loans, and gifts which we now find are cheaper. Several utilities have found it is cheaper to give away residential weatherization than to service and subsidize a zero interest loan to do the same thing. Southern California Edison has given away a half million compact fluorescent lamps of the kind Zak was holding up earlier because it is cheaper for them to do that, namely 1.8¢ a kilowatt hour, than to operate their thermal capacity. Some of the most powerful programs are rebates, to pay people to do something. You are buying their savings cheaper than you could get them anywhere else.

Rebates can be given to the buyer, the seller, trade allies or any combination. For example, PG&E found that rather than paying you $100 to buy a very efficient refrigerator, they could get a better result, at a third of the cost by paying the person who sells you the refrigerator a $50 cash bonus if it is very efficient but no bonus if it is not. The inefficient models quickly vanish from the shop floor because there is no incentive to stock them. If your refrigerator breaks on a hot August afternoon, and you want the next one they can ship, it is going to be efficient because that is all they will have. I see some danger for Canada, to the extent that you import white goods like refrigerators, because we are now introducing in the States some moderately stringent appliance standards. You may find that we export all the inefficient models that we cannot sell to ourselves anymore. As different utilities in the U. S. have introduced their own rebate programs we have seen inefficient refrigerators and air conditioners chased from one city to another right across the country followed by rebates. It is not good to be last in the queue so I am glad you are introducing these programs. You do have the very good idea of paying people to scrap the old one. We also have roughly $1 billion a year in contracting for third party and shared savings investment and we have many utilities going into the business themselves.

Let me try some new methods on you. The main problem with rebates, although they work fine, is that the utility may end up paying more than necessary to illicit a saving and give the entrepreneur who provides the saving a fair return. The reason for the utility to finance the saving is in part that the utility may have a discount rate in real terms of 5%

a year, that is be willing to settle a payback averaging something like 14 years on a long lived investment, whereas the customer may insist on a two year payback. Many industrialists probably have a horizon of around two years on their paybacks just as many householders do. That implies a 64% a year real discount rate for long-lived investments, about 12 times the utility's discount rate. That means if the utility does not have some mechanism in place for applying the same financial criteria to its or the customers' investments, the customers are going to end up foregoing many efficiency investments. Therefore, the utility will have to make supply investments which could have been avoided at much lower cost. That is the short answer to the gentleman who asked earlier, why don't you simply raise your price? It is quite easy to show that under the discount rates customers actually use and those that utilities actually use with a tariff of 8¢ a kilowatt hour, many customers still will not buy savings that cost only 1¢ a kilowatt hour, just because of the so-called payback gap. That is part of what these financing mechanisms get around.

We are going to competitive bidding processes to try to ensure that utilities get those savings in the market at the lowest possible cost. A number of utilities have put out to bid weatherization contracts on big blocks of houses to see which contractors are willing to be compensated the least per kilowatt-hour-saved. Some utilities are running auctions for lighting. We have had a number of cogeneration auctions recently. Consistently the utilities that run them are being offered about ten times as much new capacity as they want. Central Maine Power give industrial modernization grants. They say to their industrial customers, "We would like to help you to fix up your factory to use more modern and efficient equipment or processes and the grant will go to whichever of you offers to save the most electricity per dollar of grant". They then bid against each other to see who has the best offer.

Bonneville Power Administration is giving grants for upgrading aluminum smelters which helps keep the smelters in business, protects the utility's base load sales and protect the local economy. We are now moving rapidly, in a number of states, towards generalized auctions. Central Maine Power Company is the first place to have an integrated supply and demand-side auction in which they will buy savings or supply from anybody out there at the best price that is offered. This could work, for example, in the following way: Hydro could say, "Who out there would like to save supply or displace electricity for 1¢ a kilowatt hour? Anyone who makes a bid I will sign you up. How about 1½¢? Okay, you are under contract. How about 2¢? Do not be greedy if you hold out for a high price the dance card may be full by that time Hydro only needs so much." This is a nice way of getting energy services delivered to British Columbia at the lowest possible cost. I even have utility clients that are so entrepreneurial they wish to become "megawatt brokers" and make spot and futures markets and save electricity and use the futures to hedge just like we would in the oil market. You can tell I am a free-marketer.

It would be nice if any of you could fix up your factory or your building, so it would never use more than a certain amount of electricity. You could sell an enforceable covenant to that effect back to Hydro to use as a part of their resource plan and it could even be sold and resold. We already have a precedent for that in making a market in certificates showing that air pollution has been decreased. A simple way to help make a negawatt market (negawatts are like megawatts only cheaper) would be to make savings fungible within the grid - make them wheelable just like we wheel power around. For example, if I ran a big pulp mill and I wanted cheap power, I ought to be able to come into this hotel and make an arrangement with the proprietors to fix up the lights. That is a rather lucrative investment. I ought then be able to go back to my mill and have Hydro sell me at my mill the same amount of electricity I saved here, but at an intermediate price, which we would negotiate, so that the savings were split between me and all other customers. That way the investments move off Hydro's balance sheet and on to the balance sheets of the companies that have the most incentive to achieve the savings.

New buildings, codes and standards have an important place. However, there is an even more powerful mechanism that I would like you to think about -- sliding scale hookup fees which are positive or negative depending on the efficiency of the building. The Pacific Northwest is doing something like this. If you beat the model conservation standards in certain circumstances you can get about a $2,000 rebate. If they do not get good compliance within a few years they will start introducing penalty fees for people who do not meet the standards. Massachusetts has introduced legislation to this end and it could work like this. If I am a home builder, building a typically inefficient electric sieve, I can probably make Hydro spend more on capacity to serve that new house than it cost me to build the house. All the rest of you ultimately end up paying for that capacity. It is a socialized cost. I should pay a $10,000 hookup fee if I have built something that silly. On the other hand, if I build a very efficient house that saves everyone money, I should get an $8,000 or $10,000 rebate for building it that way.

A rebate will more than pay my extra cost of building it right so I make money up front. I can then market the house by saying, "If you buy that house I am going to pay your Hydro bills for the first five years no questions asked or if it is over $100 a year I will pay the difference". As a result I will sell that house fairly fast. I do not know how your mortgage regulations work here, but in our secondary mortgage markets, if I have a house with a low Hydro bill, I can get more relaxed mortgage qualifications when I go to finance that home purchase. More people qualify to buy such a house if we label the performance of the house, so that its performance becomes internalized in its market value. Ultimately the seller will get back 15 to 25 years worth of energy savings as extra equity. Meanwhile, Hydro has saved five or ten times as much on avoided capacity and operating cost as it cost them in a rebate to get the home builder to build the thing right. So this is a win - win approach in which everybody is better off because capital is allocated to super windows and super insulation rather than to new generating capacity.

Another concept that might interest you is the lack of a franchise monopoly on selling negawatts as there is on selling megawatts. We have some electric companies which are selling electric efficiency services very profitably all over the place. Puget Power has a subsidiary selling negawatts in seven states at the moment. If one utility is not very alert to its opportunities to make money selling efficiency, another utility can come in and do it instead. I have even worked out a cunning way for gas utilities to make money selling electric efficiency and in the process open up new gas markets.

The last concept I would like to suggest is a mass retrofit. We have now five cities, namely, Boston, Austin, Seattle, Washington, D. C. and Stockholm, Sweden which are seriously considering a program to retrofit most or all of the commercial lights in town in a matter of a few years. There are some interesting precedents. Many years ago, Ontario Hydro changed the frequency of the grid over most of Southern Ontario and Los Angeles did the same thing. These were splendid examples not only of the public service mission of the Hydros, but also of good organization and logistics sometimes done by specially equipped vans going door to door. We could use similar tactics either in the public or the private sector to do mass retrofits of lights or conceivably of motors. I think there are economies of scale in doing it that way. We can very quickly achieve some very large savings.

I would like to conclude with a quick remark on what all this means for one of Hydro's principle missions: namely, economic development, which is one of the largest programs of my own institute. We are interested in how far you can achieve sustainable development, not just by export expansion, but also by import replacement and efficiency because all three of these are the classical engines of economic growth. It is quite common to find communities which send out roughly a tenth of their entire payroll to pay for energy even at today's prices. Plugging that leak of dollars out of the local economy through greater efficiency can be a very powerful kind of development.

Whatever you save in private industry on your energy bills goes straight to the bottom line as an avoided overhead. If you were in a typical marginal tax bracket you would do exactly the same thing for your bottom line by saving $1 worth of energy as you do by increasing sales $15. But you have to work harder and you have less confidence in the outcome in trying to get a $15 sales increase than in saving a dollars worth of energy.

Here is a nice example of what energy efficiency can do. South Wire is the largest U. S. independent maker of rod, cable and wire, a heavy industry. Here is what they did to the energy content per pound of product from 1980 through 1986. About three-fifths of the savings was in natural gas, two-fifths in electricity with some high efficiency motors and adjustable speed drives leaving another dozen classes of drive savings so far untapped. That is their next agenda. This reduced their energy bills to give them a margin throughout that period. The only reason that 3,500 people at its ten plants in six states still have jobs is that there were two smart engineers in the company who took economics seriously. They started going systematically through their plant saving energy costs wherever they could. They still have a great deal left to do.

My final example is a small town scale experiment is Osage, Iowa, a rural town of 4,000 people in a very hard up area. For eight or nine years the little municipal utility has been helping people weatherize their homes using nothing more sophisticated than an infrared camera, caulking guns, duct tape and insulation. The utility cut its cost so much more than its revenues that it prepaid its entire debt a couple of years ago and built a big cash surplus. When it had to go into a joint transmission venture with a dozen other little rural power systems they all had to float bonds, but Osage paid cash. The utility has cut its tariff five times in five years by a total of 32% real. Its residential rate is given the exchange rate, only a hair above what you have right here, even though it does not have hydro power.

The electric tariff and the smart management attracted two big factories to move to town. Up until that time, for eight years, the utility had had a flat demand, because the efficiency program had just kept pace with population and economic growth. When the two factories moved to town demand shot up 18%. They are now planning to reverse that by going after the commercial lighting retrofits to drop the demand some more and cut the tariff further. Most important, over $1,000 U. S. per household per year, which previously had gone out of town to buy electricity, fuels and other utility inputs, is now staying in Osage. Those dollars are largely being spent and respent locally capturing local jobs and multipliers.

Main street shows it. The Wall Street Journal just did a feature on this town describing how the bankers have 10% or 15% a year deposit growth a tenth of which is due directly to the utility bill savings, and several times that due to the multiplier. The most marginal of the three automobile dealers says that he would be out of business except for that extra purchasing power. The local independent grocer says that his electric savings are making up half of his price disadvantage against the big chain store in the next town which would otherwise take most of his business away. There are many other striking cases of this kind.

I think electric efficiency, since electricity is the costliest form of energy, has got to be one of the greatest opportunities for promoting sustainable economic development and for simultaneously making everybody better off. I am delighted to have had this opportunity to help you explore some new ways to do it and I look forward to working with many of you.

Questions

Unidentified Speaker

Do you have an air to air heat exchanger to keep the air quality clean?

Amory Lovins

We have six air to air heat exchangers. It is virtually an airtight building. The only reason we have six is that it was a cheaper to put them in specific places where we had odours or humidities, such as over the stove or the bathrooms, than to have a central unit with ducts. We have a very long skinny building and in an ordinary house it would probably be cheaper to use a central unit. In Tacoma, Washington the price dropped dramatically when a number of contractors started doing this. I think they have gone down quickly to about $860 U. S. dollars per system including the duct work installed. Having an airtight house with controlled ventilation is not part of the problem of indoor air quality. It is the only solution we have aside from keeping poisons out of the house in the first place.

Jack Meredith, British Columbia Buildings Corporation

The point you made with regard to oversized motors on fans and pumps is something we are interested in. What is the best way to determine the degree of oversizing when you do put in that higher efficiency motor?

Amory Lovins

Very careful engineering. I do not have any quick answers because there are so many factors you have to consider. There is insulation class, temperature rise and so on. In a dirty environment like a pulp mill I would look at the possibility of active air or water cooling to keep the soot that settles on the machine from preventing the escape of heat. If you have an application in which you are stirring a vat of goop, rather than using a huge motor that most of the time is over sized, I would consider something like a piggy back booster motor or a clutch fly wheel or a torque converter. In other words, have two motors, one of which cuts in when necessary. Industrial motors are unique among all energy using equipment in that the value of the energy they use each year is often a large multiple, ten or twenty times that of their entire capital cost.

If we had a meter ticking away on our large industrial motors, like a taxi meter, calibrated in dollars, we would have them looked after by people with the soul of a Porsche mechanic. I do not have an easy answer on sizing, but I think the economic optimization we use has often been terribly sloppy. Quite often somebody will look at the possible torque load on the motor, and add several different kinds of safety margins, not all of which are necessary, and then round up to the next commercial motor size. You may end up with two or three times what is really necessary to do the job.

Jack Meredith, British Columbia Buildings Corporation

That is exactly what we have found. In looking at traditional motors or installed motors, just taking amp readings on them, we find that they are one or two sizes oversized. But then we look at that amp rating, resize a new motor and put on an energy efficient motor and, more times than not, we are still oversized and we have to go back again. I thought from your comments that you might have had some trick up your sleeve as to how we can avoid one of those steps.

Amory Lovins

No, you cannot just downsize several sizes and hope. You do have to check whether it is going to work because somebody may have engineered it the first time, but that is more the exception than the rule.

Jack Meredith, British Columbia Buildings Corporation

Another question with regard to the electronic ballasts. We are just starting to see their introduction here. Can you give us some indication what is happening with the supply of them, prices and where you predict they are going to go?

Amory Lovins

Like many imports they are often held up a year or more in CSA certification. There is a new ballast made in Canada which we have just analysed. It has some rather unusual electrical properties, which are not all favourable, and the performance does not appear to be as good as some other ballasts on the market. There are approximately eight electronic ballast manufacturers of interest in North America and at least two in Europe. We have not yet finished surveying the Japanese market but this is a great example of the technology you ought to be making right here in British Columbia.

It takes very little capital to set up and make them. There are 50 or 60 little companies making these kind of things in the U. S. and they are making money with markets a lot smaller than the provincial market which B. C. Hydro's programs alone would create. Another kind of economic development you ought to be looking at is working with the entrepreneurs within this province to set up shop to make this stuff. There is no reason you should import it from the U. S. or even from Ontario.

The prices of these ballasts are quite often competitive. If you account for the fact that this replaces two conventional ballasts, there is less installation labour and there are certain other advantages. The cost premium is dropping rapidly. Remote dimming capability with a signal wire is becoming very wide spread. The intrinsic savings alone, not counting seven or eight other mechanisms, are now upwards of 40% for several brands rather than the 20% or 25% we used to assume. The market share is about 3% in the U. S., up from nothing several years ago. This is without the participation of the two largest ballast manufacturers who dominate most of the distribution channels. It is a rather uncompetitive market.

There is a similar success story on super windows which you ought to be assembling in B. C. Spectrally selective glazings, either heat mirrors or low heat glass are now about 20% of the U. S. insulated glass market and should reach 50% within three years. They are over half of the total sales of Anderson, one of our major window makers. They are expecting it to hit over 90% within a few years. A third of all the insulated glass orders in West Germany last year were filled with heavy insulating gasses, technology almost unknown in North America. This is in the building industry which is traditionally dynamically conservative. It actively resists many changes which tells you something about the advantages of something like this. It can eliminate your furnace. Therefore, greatly reduce the cost of building a house and more than pay for itself right up front.

QUESTION PERIOD

(EDITED TRANSCRIPTION)

QUESTION PERIOD - 9 JUNE 1988

Bill Best

Well we are reaching the end of the day's program, but we do have approximately half an hour for some general questions. I would like to set the stage and remind you where we have been, so that we can have some pointed questions.

We started the day by looking at B. C. Hydro's load forecast and System Plan. We were told of the future of energy requirements and how we plan to meet them. We singled out, for specific attention, two key elements of that plan. One was parallel generation, which we are going to discuss in more detail tomorrow, and the one that we have spent most of the day discussing, demand side management, strategic conservation and a number of other names that we have coined to discuss what Mr. Lovins has been speaking about. We looked specifically at the scope and types of programs that are evolving and being planned here in B. C. Hydro and Sue Hickey gave us a good overview of what has been done and is being done by the Bonneville Power Administration in the Pacific Northwestern United States.

Our own Hydro people have discussed some of the programs in a little more detail and then we have had two very stimulating and challenging addresses by Mr. Cavanagh and Mr. Lovins emphasizing that yes it is great, but there is more, stretch, look more and, maybe while you are doing what you are doing there are opportunities for even setting your sights a little higher. I think that has been particularly useful. So with that overview and remembering that we are going to deal with parallel generation tomorrow, we have all of the speakers and people who made presentations today assembled down here in the corner and I would like to ask you to direct your questions to them.

Unidentified Speaker

Mr. Chairman, I would like to comment on a mechanism which all of us are locally familiar with, which allows for increased revenue and efficiency, and which could possibly be used by B. C. Hydro and the industrial sector in encouraging both new technology in the industrial sector and in satisfying the demand side management program. It is called a variable rate curve. It is a yardstick or standard for a particular industry and it should be possible with a variable rate curve to encourage the older plants to more rapidly adopt new technology. Perhaps I would like to ask some of today's speakers to comment on this as a mechanism for controlling demand.

John Sheehan

I think it was mentioned by one of the speakers earlier today that in all of the endeavours that we are working on now, we are not in any way trying to affect the price that the customer would pay for electricity as a penalty or as a reward either. In demand side management we are trying to affect the benefit to the customer by dealing with the cost, the efficiency side. Of course, over the years there has been a lot of discussion about forcing conservation by penalizing the inefficient users in one way or another.

In other words, there is a well recognized effect of price elasticity on electricity and we are not dealing with the price elasticity in this case at all. We have not addressed that, Hydro has not addressed the difference in prices or rate design. In fact, Amory Lovins and I had some discussions about this at lunchtime. In one sense by having lower rates we are in fact encouraging power usage. We are doing various other things to discourage inefficient use. We have not explored any possibilities for improving or discouraging inefficient use of energy. I think a number of speakers today said the aims that we have are very conservative in the package of things that could be available. Perhaps we will be looking at changing the rates at another time.

Sue Hickey, Bonneville Power Administration

I was fortunate recently to attend a demand side management conference with some European countries and I was very impressed by some things they had been doing. They are using rates to cause investment in technology, and they got around the problem of being punitive in terms of raising rates to all customers.

They are proposing optional rates so that an industrial facility can choose to go on a certain tariff schedule if they adopt a technology that causes a different load shape or a different level of consumption. I do not know if that idea would be applicable here. We have not used it, but I found it tremendously exciting. It is something that I am just starting to work on internally. I am trying to encourage folks to find technologies that would be amenable to that kind of option. Maybe that is what you were referring to in terms of variable rate schedules, but it is also something Bonneville has not tried and it is important to get around the punitive side of it.

Unidentified Speaker

What I had in mind was a structure where, instead of the marginal energy rate either being constant at load, the rate increases beyond some milestone established for that industry for example, a ream of finished paper. As an industrial applications engineer, one of the difficulties I have in dealing with new technology on both new and existing plants is that, as discussed by Mr. Henriques, paybacks of more than a year are generally not attractive to the industrial investor. The market cycles are too short for a two and a half to five year payback to be attractive. But, if a payback calculation were based on a marginal energy cost that is, higher than the average cost, just like the income tax structure, then the payback calculation is made more attractive and the incentive is made that much higher. I wondered if, in the studies of this demand side management program, B. C. Hydro had looked at that possibility?

Bill Best

I know we have thought about the question of saying how can we create an incentive in our rates for those customers who have the opportunity for a more efficient process, or a more efficient plan. We have talked about the same thing you have talked about, a standard of so much per tonne of production or something of that nature. We have not pursued that in any great detail, but I think it is one of a number of things that we do need to examine because, you are quite right, we have been somewhat surprised in some of our discussions with our customers at what we consider to be the relatively high payback. Short payback periods are expected. A better vehicle for doing that might be through rate design and rate structure.

Amory Lovins, Rocky Mountain Institute

Clearly if your tariff structure, regardless of its level, signals people that marginal consumption is not worth much then it will not be worth much to them to decrease it. Given the supply curve shape, that is rising marginal costs of supply, it would certainly be more economically efficient to have the trailing block either flat or inverted compared to the base block. However, I want to make a slightly different point. The most outstanding large scale demand side management program I know of in the world is that of Southern California Edison Company which has about 10 million people in 50,000 square miles, and on a system which, in the mid 80s, had a 14 GW peak load that they routinely served for several years at declining real costs, at a saving averaging almost 1200 peak MW/year. In other words, 8½% of present load per year off their long term forecast peak load. Some of the savings were achieved immediately and some on a longer term. Almost half of it was achieved through their own programs at a cost to the utility averaging 3 mills for efficiency and 30 odd bucks a kilowatt for load management. The rest was through state action like building codes that cost them nothing. The point I am getting to is that about 85% of their savings was in the commercial and industrial sectors. Something like 80% or 85% of those savings were from rebates in which they did not change the tariff; they just altered the customer's payback perception by picking up some of the tab for certain kinds of investments. They eventually got generic rebates.

In other words, if you save electricity they would pay you several hundred dollars per peak kilowatt. Their peak constraint was an energy constraint, and they did not care how you did it. They just set out this offer as an open bid and PG&E did the same thing and got oversubscribed every year they offered it. Of course, it is not quite as efficient as competitive bidding because you set the price and somebody who can bring in $10 a kilowatt savings captures all the rent that should go largely to the other customers, but I think the principle is right. I would be much more interested in the shape of the tariff and the availability of these kinds of incentives and information to act on them than in the absolute level of tariff.

Ralph Cavanagh, Natural Resources Defence Council

Mr. Chairman, a last comment on this trade-off of rate design - efficiency payment. I think you are going to hear from your customers that people who are making decisions about conservation insist on virtually instantaneous payback, two years or less on most applications, a year or less on many. Now maybe if you were to rely simply on rate structures you would have to crack the rates up to astonishing levels to get efficiency improvement.

The question is how do you bring those payback perspectives into alignment? I think that what you are going to come to is how much are you willing to pay for variable speed drives. They are asking the right question because it will be very much worth your while compared to the alternatives of bringing that more generous payback perspective of yours to bear on your problem. If you try to do it exclusively through the rates, as in the example Amory gave, with a typical discount rate that industrial and residential customers have; you are charging someone $0.08/kWh, but they will not even invest up to $0.01/kWh in demand side management. If you want someone to invest up to say $0.04/kWh in efficiency you would have to get the trailing step up to something like $0.40/kWh and that is probably not an option that is going to sell well anywhere. The investment alternative may well work.

Bill Best

Of course, we also have the very practical consideration, one of Hydro's main objectives, which is supporting economic development in the province. We cannot, for the sake of getting energy efficiency crank our prices way up and put our manufacturers, developers and so forth at a competitive disadvantage with other jurisdictions that are not doing that. So we do, as always in all these cases, have constraints.

Unidentified Speaker

We have heard some extremely interesting options here today as to how we should be more efficient. One of these options which I thought was very interesting is the concept of making these ballasts locally to allow us to buy them locally. We would be very interested in suppliers of high quality electronic ballast; we have pursued the source of such ballasts and have not been overly successful in finding the options available to us. However, that is something which should be produced locally. We should not have to go to hell and back to find that sort of product. Maybe if you contributed your support to some local entrepreneur to make that product, then we locally would see the benefits very quickly. In other words, it would be introduced to the business world very quickly and it would be an accepted product very, very quickly.

Bill Best

That is certainly one of our objectives. Larry, would you like to respond to that in any way by explaining the role of B. C. Hydro in trying to make that sort of thing happen in the province.

Larry Bell

Well one of the initiatives that we have taken for ourselves, and we will do it with respect to our programs, is to go out and develop suppliers and do that in a variety of ways. I think that this is a very interesting idea. I always had a notion that all the lightbulbs were made in one plant somewhere in the mid-west and there was no prospect of a second supplier. It seems to me these products as you were demonstrating were not that complex in the manufacturing and assembling process and I was just talking to my staff and we are going to pursue the idea.

Amory Lovins

In fact, just to show you how powerful they are, that little suitcase contains in North American potential about 250 GW plus one Alaska.

Unidentified Speaker

With regard to a policy of purchasing goods which are manufactured locally; I work for a manufacturer who advocates a return to B. C. content rules introduced to promote local industry by having goods purchased by industries such as B. C. Hydro. In this way, a large market could be built here in B. C. It seems that your policy, as it was set up by the provincial government, is no longer adhered to. It is difficult for industries here to compete with the high cost of labour relative to Manitoba, Ontario and most of the other provinces.

Larry Bell

In the age of GATT negotiations and free trade one has to be rather careful with respect to local preference, and it becomes ever so subtle with other jurisdictions, but it is still there. We pride ourselves in trying to offer assistance in a variety of ways. We would look, for example, to try and give you a minimum order in order to take away that initial risk of putting together an assembly line. These sorts of things I think we can use very effectively without looking to induce a higher priced product.

We would like you to have a low-priced product which we could export throughout the world. So we want to look at those kind of opportunities. We are clearly interested in helping and we have special offices in purchasing whose jobs specifically are to go out and develop B. C. suppliers. When I started as Chairman of the Purchasing Commission, one of the first orders I signed was for a bunch of shirts for our jail guards. It was from an unnamed province quite far to the east. It has bilingual labels, but at any rate, I said, "Well, we have got manufacturers down on Water Street". We did not have a B. C. bid, so I got my purchasing officer, I said, "You go down there and you get them to bid next time. I do not care what you have to do, but just get a bid in here and tell them what one this time and give them a little bit of advice". A B. C. manufacturer won the bidding process next time.

Bill Best

B. C. Hydro and utility people in general are aware that traditional projects, the dams and the thermal projects create employment and stimulate the economy through building. But we also know that the options that we have been talking about here today on demand side management, in fact, are very labour intensive in terms of creating jobs. I think that was alluded to earlier today. I am just wondering if any of our speakers have done any studies on that or if there are any good numbers or impressions about the number of jobs per megawatt created.

Ralph Cavanagh

The best study of this kind was commissioned by Bonneville Power Administration and published in 1984. It will be of interest to any of you. It is a detailed effort to answer your question in terms of job impacts of a particular set of conservation programs. I do not recall the exact numbers in Bonneville's conclusions but they are in precise line with what you have been hearing, namely substantially larger in terms of local labour. One of the most powerful economic impacts of going with the efficiency as opposed to a powerplant is that, since the efficiencies are substantially cheaper, you are able to use dollars you would otherwise spend on normal plants in the general economy. The general economy is much more job intensive than the powerplants are. You ought to contact the Bonneville Power Administration, for once they can do something positive for you, and ask them for the 1984 Charles Rivers and Associate Study of the employment impacts of conservation versus power development. They will give you the numbers and that is the most extensive and vigorous analysis to my knowledge.

Amory Lovins, Rocky Mountain Institute

In very round numbers, and it varies a lot according to the specific assumptions, you get roughly three times as many person years of employment out of an old style, that is fairly expensive efficiency investments, as you do out of thermal power stations. There is, in fact, nothing in the whole economy that has fewer jobs per dollar invested than power stations, and that means in U.S. terms, at least, that every thousand megawatt plant we build, directly and indirectly, takes from the economy, several thousand net jobs because we take away capital which would have made more jobs if invested in any other way.

A further important feature is the powerplants take much longer to build and then a long time to pay back, so the money is in effect tied up for a long time. Whereas, if you make modular efficiency investments, they are very quick to build, they are very quick to pay back, you effectively multiply your money at this high velocity, so that the respending within the economy is much faster and greater. Money turns over, in other words, many times within the same period. Finally, the jobs that you get are of quite a different character. They are not very good for heavy equipment operators. They are very good for ordinary building trades. They tend to be dispersed through every community rather than concentrated in one construction site.

Joe Stauder

If you want to develop 200 megawatts of conservation to produce power you have to finance it somewhere, somehow, how do you borrow the money -- against what?

Ralph Cavanagh, Natural Resources Defense Council

I will start and Amory can complete it. If it is done in the way which we recommended, you are right, the money does not appear by magic, it is paid for by the other ratepayers on the system through their electric bills. The basis for paying for it is that we have your resources which are a better buy than the alternative resources which ratepayers' funds would otherwise have purchased.

I tried, in my remarks, to suggest three additional central financing sources. One of these is from purchases of power by long term marketing in California and the Pacific Northwest. Financing some of that generation from purchases of surplus power conservation allows you to sell on a long term basis to other buyers.

Let us not try to disguise the fact that surplus power conservation must be paid for just like any other resource. What exists now, at least on a number of U. S. systems, is clear precedence in place for financing conservation on a basis with any other resource and I think that is the direction in which you want to go.

Bill Best

Well it is one minute to five so we have come out right on time. In closing today's session I would like to thank the speakers very, very much for your time, for staying within your allocated times. I do not think I had to wave arms or flags at anybody. Also thanks to the audience for your attention, your courteous, but good questions.

PARALLEL GENERATION - B. C. HYDRO'S PERSPECTIVE: RATES AND FINANCIAL PARAMETERS

(EDITED TRANSCRIPTION)

JOHN ELLIOTT

Export and Interutility Marketing Manager
CORPORATE AFFAIRS
B. C. HYDRO

My purpose today is to provide you with a general summary of our purchase rates and financial parameters (Exhibit 1) that you will find in our draft policy paper on 'Purchase of Electricity by B. C. Hydro in Integrated and Non-Integrated Areas'. This paper was included in your Forum registration material. Your participation and feedback will help us firm up our direction on purchase of electricity policy development.

On the subject of purchase rates I would like to provide you some general background information, discuss integrated system purchase rates for less than 5 MW, greater than 5 MW, and lastly remote area purchase rates (Exhibit 2). I will refer to remote areas throughout this presentation, whereas our draft white paper calls them non-integrated. The two terms mean the same thing.

With financial parameters I would like to make you aware of our marginal or avoided costs and mention arrangements such as levelized purchase rates and conditions under which B. C. Hydro will consider providing a loan or grant (Exhibit 3).

As background to purchase rates, we believe that private supplier costs can compete with new B. C. Hydro integrated system resource costs as well as our remote generation costs. Being competitive allows us to defer B. C. Hydro resources on the integrated system and, in our remote areas, reduce losses. These losses last year amounted to approximately $15 million. We intend to purchase by a competitive negotiation process (Exhibit 4), this will be done through an annual request for proposals for specific blocks of required electricity supply on the integrated system and in our remote areas. For remote areas, we will consider request for proposals for areas other than Atlin, Bella Coola, Masset and Sandspit where negotiations or discussions are currently in progress.

For projects under 5 MW on the integrated system, the proposed purchase rate will be between 2½ and 3 cents per kilowatt hour, not 3 cents as shown on this draft slide (Exhibit 5). The actual price will be set by October 1st of this year and adjusted annually to minimize transaction costs. This set price will reflect a value between our short and long-term marginal energy costs. We have targetted to request proposals to accept up to 25 MW total of electricity in blocks under 5 MW in the Spring of each year, commencing in the 1989.

On projects greater than 5 MW on the integrated system, the purchase price will be negotiated (Exhibit 6). The rate must be less than B. C. Hydro's published marginal costs and reflect consideration for the reliability and quality of the electricity supply, including the annual amount and duration of such supply and provide a return to the supplier. This rate could be either adjusted annually, based on the changes in our marginal costs or, possibly, by fixed or levelized prices for a number of years which would be done by a negotiation. In this category, we expect to have a request for proposals in the Fall of '88 for approximately 100 to 200 MW of electricity for B. C. domestic purposes, and a call for approximately 400 MW of electricity for export purposes. The reason for an export call for tenders is to provide a price signal to explore future potential sales with our American neighbours.

The purchase rate in remote areas has a similar basis to the previous integrated purchases over 5 MW (Exhibit 7). Again, the rate will be negotiated and it must reduce B. C. Hydro's cost in these areas, that is, the rate must be less than our marginal, or in this case, avoided costs, include consideration for the reliability and quality of the electricity supply, including annual amounts and duration of such supply and provide a return to the supplier. We should be issuing requests for proposals, this fall, for specific remote areas where discussions or negotiations are not currently in progress.

Before talking about financial parameters I would like to show you again B. C. Hydro's marginal costs on the integrated system as Ken Peterson showed you yesterday. Today, our marginal cost is approximately 1½ cents per kilowatt hour, rising to 2½ cents around the mid 90s and to about 3.4 cents per kilowatt hour at the turn of the century.

In our remote areas, B. C. Hydro's generation or avoided costs ranged from 16 to 32 cents per kilowatt hour for the last fiscal year. These costs are comprised of fuel and lube oil, operation and maintenance, and fixed costs. But do not get your hopes too high, that 32 cents per kilowatt hour is an anomaly from last year as a major overhaul was done at a very small remote diesel site.

For projects greater than 5 MW on the integrated system and remote areas, financial arrangements may be negotiated so long as there are benefits to B. C. Hydro and the private supplier. One consideration is levelized or front loaded rates (Exhibit 8), which is indicated by the dotted line CD on the slide, as opposed to a base price that is indexed (which is the sloped line AB on the slide). A levelized rate improves the projects cash flow in the early years and helps the private supplier to obtain financing. It provides an overpayment in the project's early years in return for underpayments in later years. The intent with levelized rates is to ensure that the overpayments, that is, the left shaded area, match the underpayments, the right shaded area, over a specific time period. This type of arrangement will require performance guarantees.

For projects over 5 MW on the integrated system and remote areas, we may offer a low interest loan or grant to reduce capital costs and lower the purchase price (Exhibit 9). For this the project aspects and B. C. Hydro concerns must be addressed and assessed.

As far as project aspects are concerned:

1. Will it be a sale of electricity to Hydro?
2. If it is a co-generator, will it reduce existing or future B. C. Hydro supply and is it a new or incremental process load and will B. C. Hydro standby be required in the event of forced or unscheduled outages?

3. What is the timing or in-service date of the project?
4. How will it interconnect to B. C. Hydro?
5. What return on investment target does the private supplier anticipate?

B. C Hydro concerns must reflect our marginal costs including, a comparison to other available B. C. Hydro resource options at that time (Exhibit 10). We must look at the impacts on our system; would we have to advance or could we defer resources, and would the transmission or distribution system require reinforcement? As well, what is the financial security of the project, that is, will this project perform reliably over the contract life?

In providing service, our customers insist and depend on our reliability and quality of electricity supply, and they ensure that we provide it safely and efficiently at the lowest possible cost (Exhibit 11). As private resource suppliers forming part of our future B. C. resource development strategy, you will become an integral part in maintaining this primary B. C. Hydro customer service objective.

PURCHASE RATES

FINANCIAL PARAMETERS

Exhibit 1

PURCHASE RATES

- GENERAL
- INTEGRATED SYSTEM - < 5MW

  - > 5MW
- REMOTE AREAS

Exhibit 2

FINANCIAL PARAMETERS

- BCH MARGINAL/AVOIDED COSTS
- LEVELIZED RATES
- BCH LOAN/GRANT

Exhibit 3

PURCHASE – GENERAL

- COMPETITIVE NEGOTIATION
  - RFP - ELECTRICITY SUPPLY
    - INTEGRATED/REMOTE

Exhibit 4

PURCHASE RATES INTEGRATED SYSTEM

- PROJECTS < 5MW

3¢/KW.h

(DRAFT)

Exhibit 5

PURCHASE RATES - INTEGRATED SYSTEM

PROJECTS > 5MW

- NEGOTIATED
- RATE
  - < BCH MARGINAL COSTS
  - RELIABILITY/QUALITY
  - ANNUAL AMOUNT
  - RETURN TO SUPPLIER

(DRAFT)

Exhibit 6

PURCHASE RATE

REMOTE AREAS

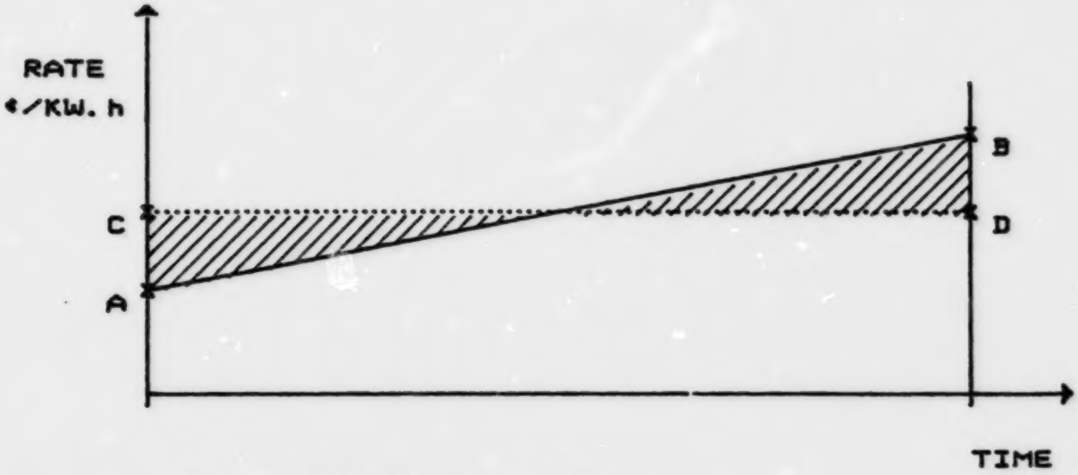
- NEGOTIATED
- RATE
  - <BCH MARGINAL COSTS
  - RELIABILITY/QUALITY
  - ANNUAL AMOUNT
  - RETURN TO SUPPLIER

(DRAFT)

Exhibit 7

FINANCIAL PARAMETERS

LEVELIZED RATES



AB - BASE PRICE (INDEXED)
CD - LEVELIZED

Exhibit 8

BCH LOAN/GRANT

PROJECT ASPECTS

- SALE TO BCH
- COGENERATOR
  - REDUCE BCH SUPPLY
  - NEW/INCREMENTAL PROCESS
  - BCH STANDBY
- TIMING
- INTERCONNECTION
- ROI

Exhibit 9

BCH LOAN/GRANT

BCH CONCERNS

- MARGINAL COSTS
- OTHER RESOURCE OPTIONS
- IMPACTS
  - ADVANCE/DEFER RESOURCES
  - SYSTEM REINFORCEMENT
- FINANCIAL SECURITY

Exhibit 10

BCH OBJECTIVE

SERVICE TO CUSTOMERS

- RELIABILITY/QUALITY
- SAFETY
- EFFICIENCY
- COST

Exhibit 11

PARALLEL GENERATION
INTERCONNECTION REQUIREMENTS AND WHEELING

(PRE-PRINT)

BRUCE G. PRIOR

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SYSTEM DEVELOPMENT
B. C. HYDRO

PARALLEL GENERATION
INTERCONNECTION REQUIREMENTS AND WHEELING

CONTENTS

Section	Subject	Page
1.0	Introduction	3 - 4
2.0	System Planning Considerations	3 - 5
3.0	Interconnection Requirements	3 - 5
4.0	Wheeling	3 - 8
5.0	References	3 - 9

1.0 INTRODUCTION

B. C. Hydro is considering the purchase of energy and capacity from independent power producers (IPP) as part of its future resource development strategy. This paper discusses the technical requirements for connection of non-utility generation to the B. C. Hydro electric transmission network and then goes on to consider access and use of the transmission network (wheeling) by independent power producers.

A draft policy, "Purchase of Electricity by B. C. Hydro in Integrated and Non-Integrated Areas", is now available. It includes brief sections on the same subjects as this paper, Interconnection Requirements and Wheeling Services, but this paper addresses the subjects from a broader perspective, concentrating on power system planning considerations.

One objective of the draft policy is to ensure that the technical design of a privately developed generation project will be as complete and comprehensive as the design B. C. Hydro would prepare in the circumstances. B. C. Hydro's position is that the electricity will ultimately be purchased by customers who expect utility grade service. As long as customers continue to receive such service at a reasonable cost, it will be immaterial to them who owns and operates the various components of the supply system.

To the uninitiated developer, B. C. Hydro's technical requirements may first appear excessive or even as a deliberate attempt to defer or block the development. The recent history of independent power production in the United States records many examples of technical requirements being imposed by utilities presumably to block or defer non-utility projects. B. C. Hydro is studying the American experience with the intent of adapting the successful parts of their programs and avoiding the pitfalls. Unlike the American situation, there is no statute in British Columbia that requires B. C. Hydro to purchase privately generated energy regardless of need or price. B. C. Hydro proposes to purchase energy but only when additional energy is required, when the price is attractive, and when it can be obtained without jeopardizing quality of service to customers.

B. C. Hydro will consult with independent power producers (this Electric Energy Forum is a good example) to describe and explain technical requirements. The consultations are intended to have two results: B. C. Hydro engineers will gain an appreciation of the economic pressures on the developers and the developers will better understand B. C. Hydro's objectives of safety, reliability, and quality of supply.

2.0 SYSTEM PLANNING CONSIDERATIONS

While it may seem obvious, it needs to be said that electricity is generated and transmitted in accordance with physical laws. The electricity doesn't recognize man's jurisdictions in its flow from generator to customer. Ideally then, the power system should be designed and operated as a single integrated system to generate, transmit, and distribute power to the customer safely, reliably, and economically with as little consideration as possible to the ownership of the power system components. It is the performance of the entire system as one entity that matters.

The usual system planning process is a feedback loop beginning with load forecasting, then resource inventory and selection, transmission expansion studies, cost estimating (capital and operating), and finally returning to resource alternatives once more. If an independent power producer's proposal is made known soon enough it becomes one more alternative in the generation planner's inventory and can be accommodated in accordance with the schedule of system expansion developments as driven by the load forecast. If the IPP's proposal is uncertain in, say, design rating, operational reliability or in-service date, the generation planner cannot treat it as a proven inventory item but may still factor it into his inventory of future resource alternatives by assigning it a probability of development. When unproven resources are assigned a probability of development, they can be compared with the probability of the load forecast to obtain a statistical load-resource balance.

As said earlier, B. C. Hydro's strategy is to encourage development of non-utility generation resources to meet growing demand for electricity and to postpone the day when additional major generation facilities must be built. If non-utility generation is to be effective in deferring the need for major resource development, it should be proven technically and economically in plenty of time for it to become part of the system planner's development plan.

3.0 INTERCONNECTION REQUIREMENTS

B. C. Hydro's hierarchy of technical requirements for all significant installations also applies to interconnection of parallel generation. The hierarchy runs from general to specific, beginning with safety:

1. Health and safety of the general public at all times.

2. Health and safety of B. C. Hydro personnel in the performance of their duties during normal and emergency situations.

3. Adequacy of B. C. Hydro equipment during normal and emergency situations.

4. Quality of electrical supply to existing B. C. Hydro customers.

5. Security and reliability of supply to existing B. C. Hydro customers.

6. Detailed technical requirements.

The first two items are fundamental and will not be discussed further except to mention the requirement for a visual common point of isolation between the B. C. Hydro system and the parallel generator. An isolating switch capable of being locked in the open position must be provided to ensure that both B. C. Hydro personnel and the independent producer's staff are not at risk as a result of the other party energizing their part of the system without warning. The independent producer will be expected to include this switch as part of his design cost and must provide for access by B. C. Hydro personnel to lock open the switch when necessary for maintenance or repair of the B. C. Hydro system.

Quality of Supply refers primarily to the voltage and frequency of delivered electricity at the customer's point of connection. Voltage must exhibit a sinusoidal waveform and voltage magnitude must remain within a specified range. A parallel generator must not impair existing quality of supply to B. C. Hydro's customers and the parallel generator itself must delivery a quality supply.

Frequency is regulated to better than 0.1 percent in the B. C. Hydro integrated system and strong interconnections to the much larger American grid ensure that frequency deviates very little from 60 Hz except immediately following significant disturbances in B. C. or the U.S.A. A small generator feeding into the B. C. Hydro integrated system would be unable to influence supply frequency, but in isolated areas of the province now served by diesel generation, an independent producer would be required to install adequate frequency control (speed governing) equipment. Situations could arise where a disturbance in the integrated system could result in isolation of a portion of the system, leaving it with no supply other than the independent producer. This may or may not be acceptable, depending on the probability of such an occurrence and on the capacity and voltage and frequency control characteristics of the parallel generator.

Security and Reliability also refer both to the proposed parallel generator and to the existing service to customers. A supply is secure if it is designed to withstand reasonably probable disturbances. Under this definition, a supply connected by a single transmission line is not secure since every tripout of the line results in disconnection of the supply. For small parallel generators, a single connection will be acceptable, but if tripouts of the generator also cause tripping of B. C. Hydro customers, it will be unacceptable. Reliability differs from security in that it is a statistical measure of long-term performance of a system. An emergency supply system is reliable if the number of service interruptions over time is small and the sum of all outage durations is also small. It will be argued that many small independent producers are inherently more reliable than one or two large utility generators. In an aggregate sense of overall energy supply to the integrated system this may be true, but in specific locations connection of a poorly designed, unreliable generator could degrade reliability of service even in the integrated system. In the non-integrated areas, an independent producer will probably be displacing diesel generation and will normally be the only supply up and running. Every failure of the supply will mean tripping of customers so supply reliability should equal and preferably well exceed that of the existing diesel supply.

In general, the detailed technical interconnection requirements will be standardized for developments smaller than five megawatt (5000 kW) capacity. Larger installations will usually require individual treatment. In both small and large capacity situations, however, a major consideration will be the strength (fault level, number of transmission lines, etc.) of the B. C. Hydro system at the point of interconnection. In a relatively weak part of the system, even a 1 MW unit might require additional protection and control features.

The plan for connecting a non-utility generator to the B. C. Hydro network will include most if not all the following factors to achieve effective and reliable operation under all reasonably expected system conditions:

1. Interruption and isolation devices.
2. Transmission connection.
3. Transfer limits.
4. Equipment ratings.
5. Governor response.
6. Synchronization and auto-reclosing.
7. Generation control and scheduling.
8. Voltage regulation and power factor control.
9. Reactive power requirements.
10. Short circuit conditions.
11. Transient and dynamic stability limitations.
12. Normal and emergency loading.
13. System protection and other controls.
14. Phase balance.
15. Harmonics.
16. Communications during normal and emergency conditions.
17. Supervisory control and data acquisition.
18. Metering.

The details of all of the above requirements will be provided in a manual of technical connection requirements to be prepared by B. C. Hydro for distribution to prospective suppliers.

4.0 WHEELING

Wheeling can be defined as the transmission of electric power and energy by a system that is neither the source or destination of that power or energy. Another definition of wheeling is the transmission of electric power not owned by the owner of the transmission system.

The ideal wheeling transaction is one in which the electricity consumer obtains a lower rate, the independent power producer sells energy at a reasonable profit, and the wheeling utility incurs no uncompensated loss and no degradation of its system security and reliability.

Technically, electric power wheeled through a transmission system cannot be distinguished from power flowing without any wheeling agreement in place. But often an agreement to wheel power will result in an incremental increase in transmission line loading which will, in turn, accelerate the need for transmission line additions. The additional line loading will also result in higher line losses (the losses might be significantly higher if the lines are heavily loaded prior to the wheeling transaction). System expansion advancements and operating costs are therefore the principal costs facing a utility considering a wheeling transaction.

An electric power system consists primarily of generating stations, switching and transformer stations, transmission lines and distribution lines. Energy cannot be stored in the system so the amount of generation in operation at any time must equal exactly the load to be served plus losses. Since load is changing all the time, an automatic generation control system is provided to regulate the output of selected generators to maintain the generation-load balance.

As an example of how a power system accommodates a wheeling transaction, consider an independent power producer with a 10 MW generating station near Prince George. If he were to contract to serve a 10 MW load in the Lower Mainland by wheeling power through the B. C. Hydro transmission network, he would synchronize (connect) his generator to the B. C. Hydro system and slowly open the steam valves, hydraulic wicket gates, or throttles as the case might be. His generator would begin to inject power into the B. C. Hydro network. The B. C. Hydro automatic generation control system would immediately detect an excess of power in the system and send a signal to selected generators to back off their output. The result would be that one or more of B. C. Hydro's generators would now be delivering a net output approximately 10 MW less than before and power flow through B. C. Hydro's transmission lines would have changed to accommodate the fact that 10 MW would now be entering the system at the IPP's site rather than at the location of the selected (controlled) generators. The 10 MW Lower Mainland load would now be deemed to be supplied by the independent power producer and B. C. Hydro would be providing only a wheeling service.

Should the Lower Mainland 10 MW load fluctuate over time, it would be B. C. Hydro's automatic generation control which would track the fluctuations and B. C. Hydro's generators which would make up the differences. Also if the IPP's generator should fail, the Lower Mainland 10 MW load would continue to be served without interruption by B. C. Hydro and the generation deficit would be picked up by B. C. Hydro's controlled generation. B. C. Hydro would, therefore, not only be providing a wheeling service but also a load-following service and an emergency standby service for both the Lower Mainland load and the IPP's generator.

The lines near the Lower Mainland load might not exhibit any observable difference in loading before and after the connection of the IPP's generating plant. In many wheeling transactions there's no single transmission path over which the additional loading from the IPP's plant can be observed. The entire transmission system effectively absorbs the power from all connected generation in the system regardless of ownership and delivers it to all loads in accordance with physical laws. The changes in transmission loading cannot be intuitively predicted except in extremely simple cases and system simulation studies must be conducted to determine the effects of wheeling on the steady state and dynamic performance of the system.

The changes in transmission line flows resulting from a wheeling transaction are at the centre of all attempts to determine a price for wheeling services.

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QUESTIONS

W. P. Johnson, Phillips, Barratt, Kaiser

Who pays for the B. C. Hydro studies on wheeling?

Bruce Prior

The wheeling studies would be done by B. C. Hydro at the expense of the proposer.

PARALLEL GENERATION SUPPLIER'S PERSPECTIVE - SMALL HYDRO

(EDITED TRANSCRIPTION)

CLYDE COATS

President
THE COATS GROUP
Gabriola Island, B. C.

As you will all very quickly discover I am not a public speaker. In fact, I am very seriously wondering why I am here and whether somebody put the wrong name on the speaker's rosters when they mailed them out. People ask me what I do for a living, I describe myself as an entrepreneur which to me means I have come up with the ideas for many different small businesses. I have built the businesses, they operate profitably I hope, and I still own them. I am probably what would represent to you the average entrepreneur, the small hydro producer that you are going to be dealing with in the near future.

An entrepreneur is probably the antithesis and as far removed as you can be in British Columbia from anyone in the B. C. Hydro executive group. I have never had a wage in my life. I hear things about medical plans, dental plans, pension plans. My only answer to that is that by the time these pension plans and everything come into being and the baby boom moves along maybe they will not be there so we will all be equal in the end as well. However, this morning (various other B. C. Hydro officials will realize) I have been working most of the night, which is typical for an entrepreneur.

As you noticed when you looked out this morning there was rain pouring down. Well, for somebody that just put a small hydro plant on stream feeding into B. C. Hydro on the driest year on record and who looks out and sees it is raining, that is beautiful. But when things go well some days they do not stop just at one thing. After we worked this morning, I went to the Speaker's breakfast. The other speakers will notice I was in and out of the room. I ran and pulled various Hydro officials out into the corridor, and then I pulled my crew back into the corridor. I do not have a copy here to show you, but I am very proud to announce that this morning B. C. Hydro have initialled and we have initialled the Queen Charlotte Power Corporation agreement to supply 6 MW of power to the Sandspit Grid in the Queen Charlotte Islands. And at this time I would like to say thank you to Hydro, it has been a long, difficult negotiation.

I would like to just give another credit here. While I stand here today and say we have signed it, there is one other man in the room who probably will not stand up, but who started the idea, has stayed with it year after year and has worked in small hydro. He is the Chairman of Highland Energy Systems, Ron Swanson. It is Ron's persistence, drive and the true spirit of Canada that got this thing signed. I know very few other people that would have hung in, so thank you very much Ron.

Two days ago, I arrived in Vancouver with a nicely typed speech. Last night, after signing various documents, you will see that I made amendments to this speech, and I arrived here this morning nervous and shaking. At this conference B. C. Hydro would like to know what we think of them. They would like to know what the small hydro perspective is, and that is what they are going to hear this morning.

Parallel generation is province-wide. The opportunities are from the Rockies up into the Okanagan and to the Gulf Islands where my small hydro plant is located. It may be a water main from a Hydro project running into a reservoir and the energy there can be taken out maybe at 50 MW plants somewhere else or it may be a little plant on the Gulf Islands, a first and which is mine, and which is rather precedent setting.

The volume of small hydro available to B. C. Hydro, I am a firm believer, is equal to that of the Site C dam. Many people say it is much bigger than that, but when I say the Site C dam in potential, that is without damming rivers of fish, without flooding valleys, without creating environmental mess and hazard, which makes it quite exciting.

There is a hidden benefit which B. C. Hydro never reflects in the rate structure or the discussions, and it is very difficult for them to do this because it is not easily measured. But B. C. Hydro, currently, as we all realize, has a debt equity ratio of about 80%. An extremely high debt load. If they build Site C and the debt load stays at 80% or even goes higher, our provincial credit rating for every loan this province makes drops another point on the Moody Point Index. If small hydro replaces that power, and there is no debt load for B. C. Hydro, and the provincial credit rating goes up one more Moody Point, the interest saving for every loan this government makes in the province stays here. That saving is never reflected in discussions with B. C. Hydro and cannot be because it is beyond their scope to so do. An example of that is my own little plant on Gabriola Island which is 150 kW and very small. It was built with no risk to Hydro. None at all, financially, engineering-wise, no responsibility at all. They had full control of approvals only. It fits in extremely well environmentally. A benefit of my plant is that the labour was 100% local. In small communities we usually have a higher unemployment rate than in metropolitan areas and my plant took about five times the labour per kWh that B. C. Hydro would use to build a massive plant. So small hydro is far better for provincial employment.

I would also like to say I am extremely proud to be part of small hydro. I am in many other businesses, but this would be the one industry that I am the proudest to be in. The reason I am proud of it is, it represents an industry which is clean and non-polluting, it requires no energy supply and when the rain falls we produce power; it is exciting. When I built my little plant on Gabriola, and I did a good job of building it, 20 years later when I pass on to my great reward and my children run it, and when everybody I know has passed on, I assure you that somebody else will fix that plant and it will produce electricity in perpetuity for the good of our society without creating pollution, without flooding or any changes whatsoever. So once you build a good quality installation, it is not there for the amortization period, but it is there for the future of our society and we will always require energy.

Now we come to the point of negotiations, and on reading B. C. Hydro's draft policy as was pointed out this morning "DRAFT", "DRAFT", "DRAFT", stamped in very large letters, but it is a discussion paper. I would suggest there is not a question in my mind that all the diesel generating areas, each and every one, must be negotiated individually as in the case of the Sandspit Grid. Every one has different cost parameters, construction parameters, quality of power parameters, and each one will be unique on its own. I would also suggest to you that any site of over 10 MW should be negotiated independently because otherwise you could have three or four sites, if it was just opened up, come on at 50 or 100 MW each. B. C. Hydro would be spilling their water over the dams and would not be able to efficiently utilize the power. Therefore, they must control those. So my remarks this morning are mainly directed towards 10 MW and less which will be the big majority of small hydro producers.

The history of my negotiations with B. C. Hydro has been with the 150 kW plant, and you may laugh at this, which I claim is the backbone of the B. C. Hydro grid. It took two years of intensive negotiation to close that agreement. The history of the Queen Charlotte Power Corporation (QCPC) agreement which I came into and have helped close, as the Chairman stated yesterday morning, was two and a half years in negotiation. B. C. Hydro in the Head Office, their Chairman, Ken, Chris and the rest are a great bunch of guys and I have enjoyed their coffee. I hope someday their coffee includes donuts, and I highly recommend that for extended negotiations. However, I would far rather be out constructing sites. A small hydro person does not wear a suit and a shirt and tie. He is not in a suite of offices, he is out building, constructing and doing the things he loves to do.

So to enlarge on this a bit, for the last five years I have spent a large portion of my time involved in small hydro. Both my own project and the QCPC Sandspit project. A large part of this time has been spent negotiating with B. C. Hydro. This may or may not make me the resident B. C. expert in the field, but it certainly has produced absolutely unbelievable experiences. Phenomenal, walking out in the street and having lunch and shaking my head, coming back next day and carrying on and finally closing an agreement. The average small hydro person would not be able to repeat this.

The men and women of small hydro are in no position to negotiate with B. C. Hydro. They are usually made up of under 10 people, one or two partners, three or four people, seldom are there 10 people in one of these small companies. They need money to carry on month after month in negotiations. To B. C. Hydro this may be a very nominal amount, but when it is coming out of your wife's little salary or your other businesses it certainly adds up. They do not have the time because most small hydro producers are running a little logging company or they own a gravel truck or a backhoe. They are small and most importantly, they are not in a position to negotiate with B. C. Hydro because they have never negotiated. And it is a different world, and while the gentlemen of B. C. Hydro are not what I call super-hard negotiators, when you have negotiated deal after deal for 20 years, you are doing things you do not even realize you are doing. Whereas the other poor person coming to town for a quick Hydro contract is overwhelmed, I quite understand B. C. Hydro saying, "Well, this is just the normal way we do it".

So what I want to do now is to share with you some of the insights which I have distilled, and that was during the meetings not after the meetings, over this time period. I believe that for cogeneration to be a viable option in this province, three factors are essential. We must have a business environment which is conducive to small hydro. We must have policy stability, and we must insist on economic reality. Let me repeat that. We must have a business environment, policy stability and economic reality before things will work.

Now the term small hydro is thrown around a lot, so I would like to clarify for a moment just who I think the small hydro producers are. As I explained they are very, very small people. They are willing to take risks in order to build their concept of independence. A large part of the reward is the pride they feel in their creation. In many cases they have been educated in the school of hard knocks and have learned to operate under restraint, not because of a government directive but because they had no other options. You will usually find them on the job site and seldom in offices as I have mentioned. These men and women are the backbone of British Columbia. British Columbia Hydro and Power Authority, on the other hand, is a large bureaucracy with many separate divisions. A stratified management hierarchy, and employees who implement the corporate policy. As with any large institution the scope for individual initiative is severely limited. As a major utility, B. C. Hydro has a totally different concept of financing and depreciation as well as a fixed profit or return guaranteed by the government, Public Utilities Commission, etc. This happens in no other form of business and has a significant impact on the methods of conducting business.

B. C. Hydro currently has three separate functions in its electrical energy group as viewed from the outside. It operates a construction company that builds your dams and your power lines. It acts as a utility which is where I believe it belongs distributing the power, and it acts as a producer. Those actual men in the dams and the generating stations that make them work, produce the power and maintain the same. It has, I do not know how many employees, I will say 3,000, and with our negotiations on QCPC that was the piece of information I forgot to get this morning, but compared to 10 people it is overwhelming to the small person.

As you can see these two very disparate groups are trying to come together to do business and it is very difficult. It is perhaps not surprising that they more often bump heads because they have such completely opposite operations. There must be some outside parameter set up which both groups are forced to adhere to if there is ever to be a substantial number of small hydro plants on the grid. This is why business environment, policy stability and economic reality must be put in place first.

For small hydro to flourish there must be a reversal of the current business environment. Mother Hydro does not really want small hydro to grow up to independence, to become a potential rival, yet Hydro has been forced to deal with this teenager demanding freedom and the right to become an adult in its own right. I have three teenagers at home. I never wanted them to go out. My daughter was not going to have her first date. When she was 36 I was going to approve and go along with her. My daughter is now turning 20, she has a boyfriend, she is going to college, and I assure you that the President of that college if he knew how much I would pay to have her there for 10 months a year, he would triple the rates and my daughter would still be in college. I am ready to let her fly. It is time for small hydro to be let loose.

Firstly, a business environment conducive to small hydro; there must be recognition that small hydro producers are not public utilities and should not be expected to act like public utilities. They are small businesses like thousands of other small businesses in this province, owned and operated by individuals, partnerships and very small companies. Their ability to raise financing for their projects depends on their own net worth, their business track record and the quality of the B. C. Hydro agreement. It must be clearly realized that environmentally, socially and economically small hydro is excellent for British Columbia, better than the other sources. B. C. Hydro must actively encourage small hydro and promote it in order for small hydro to become a reality.

The second factor I have mentioned is policy stability. As with large hydro, small hydro requires massive capital investment on day one. Therefore, before small hydro can be viable in a business sense, B. C. Hydro or the government of B. C. must make a firm policy commitment that small hydro is either going to be supported or it is not. This present wishy-washiness backward and forward cannot continue. If it is decided that small hydro is desirable, then a fair policy must be developed reflecting the provincial good. B. C. Hydro cannot take advantage of the small hydro producer by removing all incentive. This policy must include such things as a take-or-pay clause. It must take inflation into account along with B. C. Hydro's total savings, not the apparent savings. This is the only way to ensure a long-term policy is maintained and hence allow financing of these projects. Even where outside financing is not required a long-term guarantee of revenue is necessary before anyone will undertake the massive investment. And for that it was so exciting to see in the proposal a 20 year term for all small hydro producers. That is an excellent first step.

Finally, economic reality must be considered. No business person is going to invest heavily in terms of capital, time and labour if the return is nominal. Risk taking requires incentive. The bigger the risk, the bigger the incentive. I would propose that B. C. Hydro should pay a rate based on the total displaced cost of putting on a large, new hydro plant on stream, taking into account Hydro's increased interest savings by deferring Site C dam for 10 years. You know ladies and gentlemen, profit is not a dirty word. Profit is what makes the free enterprise system go. Profit is why I am here. We are not employees, we are profit orientated people, and to go to the Queen Charlotte Islands there must be a profit.

Economic reality, if someone can supply power to your grid below your production cost, the power should be purchased from them. If they are just getting started surely it should be encouraged. This could be done by giving the full displacement cost profits as in the share the savings principle, or permitting a utility rate of return on their equity. If the latter policy is used in other industries you would not have a sawmill, a pulp mill and you could not go out of this hotel and get a taxi to take you home. Your purchase policy presented in yesterday's draft representing from \$0.015 - \$0.025 is not even in the ball park. Ontario's currently paying roughly \$0.05, California (in Canadian funds) pays roughly \$0.075, and the proposed big step for B. C. Hydro is to pay, I believe, up to \$0.025. At that rate we do not have a small hydro industry. Without a reward no one will take the risk.

To illustrate why I feel the above three factors are so important I would like to draw on my experience in negotiating with B. C. Hydro concerning small hydro production. When I started negotiating with B. C. Hydro for the sale of power from my own private generating station the company policy was that it would buy power at a price equal to the end step. I went to the local engineer through the department head to the regional manager and they all said B. C. Hydro would never buy power from a small producer. When I eventually signed the agreement, they insisted that my 150 kW not come on during their peak period in the summer, 150 kW might effect them. I could not come onstream for three years. The business environment was certainly not supportive. Company policy was definitely not stable and and the rate structure that I was able to negotiate indicated there was not a lot of economic reality floating around either.

Queen Charlotte Power Corporation entered and won a competition sponsored by B. C. Hydro to provide power to the Queen Charlotte Islands. Once Queen Charlotte Power had convinced B. C. Hydro of the feasibility of the project negotiations got under way for a power purchase agreement based on the share the savings principle put forward by B. C. Hydro. Eighteen months later after numerable meetings, \$20,000 of my legal bills alone, an investment of half a million dollars for the engineering studies, and this is from a small hydro company, small people, both parties reached agreement and were ready to sign.

At that point Hydro unilaterally changed the rules of the game. A share the savings approach went out the window, was totally cancelled and replaced by a new utility policy. We were back to square one.

Throughout these negotiations, it was apparent that, despite B. C. Hydro having initially requested a small hydro involvement, a great lack of understanding of the business environment required for small hydro policy stability was obvious.

This points out a term which we have heard a lot about lately, namely a level playing field. Many of you are concerned that the Canada-U.S. Free Trade Agreement has not been discussed on a level playing field. That playing field is a billiard table compared to a small hydro man coming into B. C. Hydro. Unfortunately, I seem to be the only negative speaker and I like being positive. I am being negative today because I have been asked to say where it is at and in doing so I would also like to say there is nothing personal with B. C. Hydro. This province is extremely fortunate for the men and women that work there. They are better than any other company with whom I have had the privilege of dealing.

Unfortunately, I do not believe that substantial small hydro production is viable in British Columbia under the existing draft conditions or those being proposed today in your draft policy. The gulf between B. C. Hydro and small hydro producers in mindset, outlcok, method of operation and expected returns is immense. The previously mentioned conflict between B. C. Hydro's power production group and the construction and maintenance group makes it impossible for B. C. Hydro to present an unbiased offer to small hydro producers. Also, because of this uneven playing field, it is literally impossible for the small hydro producer to even it and remove those conflicts. The other point that is very difficult, but very important and intangible, is the unequal negotiating teams. As I say, it is very difficult for the person from 100 Mile House coming down to the megalopolis of Vancouver. We, unfortunately, have a third problem which is Hydro controlling the price, the game, and the rules of the game. That is a difficult poker game.

Upon viewing other grid areas in North America, it would seem that to have a large utility negotiate reasonably with a small producer it has, unfortunately, been necessary to order a large utility to pay the fixed amount. And the word order is either political pressure from the public, political pressure from the cabinet on the board of directors or a general consensus, but the word pressure is equal to the word order. It does not happen without pressure or a direct order. The large utility simply has too much power and too little appreciation for the small producer's position to bargain one on one. So much that it makes my entrepreneurial heart cringe. An entrepreneur is the antithesis to government and bureaucracy and everything that goes with it, and for an entrepreneur to stand here and say what I am about to say, I will eat these words many times over.

Things must be set by a branch of government removed from B. C. Hydro, by a board of people knowledgeable in the field, or by an outside group. This board would then be in a position to ensure policy stability and economic reality by setting the terms of the contract and the payment rate. The government can determine a suitable business environment by deciding once and for all whether it wants small hydro production, then by supporting it through reasonable land leases, water taxes and favorable legislation.

I am very sorry to come to this conclusion but having signed an agreement today, having done one two years ago, having read the position paper that was just been given to me, that is the position we were at in June of this year, not where we were six months ago, not where it would appear to be at this meeting. B. C. Hydro is very reputable, but they are all speaking from one point of view and, unfortunately, there is just one or two of us here at this meeting to express that well, gee, maybe it should not be all that point of view and I am begging for a balance. Give us an independent board. Put some Hydro people and myself on a board to set the price and then let us have people in front. But we must have balance.

While my conclusions show how long a road that we have yet to travel, I believe this type of forum is a most useful method of hearing opposing points of view. It is my hope that for the well-being of our future provincial energy supplies our government, B. C. Hydro's owner, will take action as the rest of North America has already done. I am truly sorry that my remarks accurately reflect the current conditions regarding small hydro in British Columbia.

In closing I would once again like to express how fortunate we are to have this energy option -- the greatest and the best in the world. I am certain that we will eventually be successful in making it happen in a form that is good for B. C. Hydro and for the small hydro producers. I see no impediment, whatsoever, in the management of B. C. Hydro. And I want to express and emphasize that they are excellent. All that is missing is that they may have the correct point of view for B. C. Hydro, but the provincial good has not been achieved because there is only one point of view in the spectrum and this point of view controls all the rules, the pricing and the game floor. So it is certainly not without hope, and the seminar we have attended today has shown B. C. Hydro is making a genuine effort to move. It is still my considered opinion that for small hydro to flourish we need the actual contract and pricing controlled by an independent board, party, government, whatever.

I would like very much to say thank you to the organizers of this session. I would like to say, as a speaker, they have given me backup and made me most welcome and I have never seen a better run seminar. I say that at this time because the people that put all this on and do all the work behind the scenes they never get a thank you and I would like to propose just a handclap for those people that work so tirelessly behind the scenes and they have earned it. So I say thank you to them wherever they are.

And I would like to say thank you to B. C. Hydro for doing the job they have done, running our grid system up to this date and the fact that they are prepared to change and listen. I look forward to massive change and I have suggested the only way I can see it being successful and dynamic enough and fulfil the needs of our province. We are extremely fortunate to be British Columbia citizens. We live in the best part of the world. Discussing these energy options today I look at my friend from California, they would dream to have these problems. So thank God we are British Columbians.

CO-GENERATION AT CARIBOO PULP AND PAPER COMPANY

(PRE-PRINT)

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Assistant Technical Superintendent and Energy Coordinator
CARIBOO PULP AND PAPER COMPANY
Quesnel, B. C.

CONTENTS

Section	Subject	Page
1.0	INTRODUCTION	3 - 20
2.0	POWER BOILER	3 - 21
3.0	COGENERATION	3 - 22

1.0 INTRODUCTION

Cariboo Pulp and Paper Company has operated a fully bleached Kraft Pulp Mill since the end of 1972 in Quesnel, B. C. The Kraft process utilizes wood chips, left over wood material unsuitable for lumber or plywood products. These are cooked in a continuous digester under high temperature and pressure in the presence of white liquor, a strong caustic. The resulting fibres are separated from the spent cooking liquor, called black liquor, by drum washers. The brown fibres are bleached and dried to form a product called pulp. The dried pulp is exported worldwide and used by customers to make paper products.

The black liquor is concentrated and burned in a recovery furnace where the organic material is combusted and converted to steam and power. The inorganic material is recovered in the form of green liquor.

Green liquor is converted to white liquor and reused in the cooking process. A simplified flowchart (Exhibit 1) shows the Kraft process. Note that all the processes are continuous and that the success of the operation depends on the uninterrupted uptime of all the elements, 24 hr/d and 7 d/wk.

The steam and energy balance is shown in Exhibit 2. Two boilers produce 800,000 lbs/h @ 600 lb/in^2 to drive a 26 MW Turbo Generator. Steam at 60 lb/in^2 and 160 lb/in^2 is extracted, desuperheated and used in the various processes such as cooking, evaporation, bleaching, drying and others.

One boiler is the recovery furnace which is designed to burn black liquor and at full capacity provides about 60 percent of the energy requirements. The other boiler is a Power Boiler designed to burn hog fuel. Hog fuel is a term used to describe wood residues which are unsuitable for wood or pulp products. The Power Boiler, at full capacity, provides for about 28 percent of the energy requirements.

Exhibit 3 shows the energy sources of black liquor, hog fuel, gas and B. C. Hydro. Gas for the boilers amounts to about 6 percent of the energy requirements, gas for the lime kiln to 5 percent, as can be seen, the process operates on a high degree of self-sufficiency. If all the various departments in the pulp mill are at full capacity and are operating in a steady-state condition, no outside energy is required with the exception of gas for the lime kiln. When there are interruptions, breakdowns or planned outages both B. C. Hydro power and gas are required. Exhibit 4 shows the self-sufficiency during the last 7 years.

Exhibit 5 shows the relative energy unit costs. Black liquor is considered to have no COST since this fuel is self-generated and inherent in the process. The VALUE of black liquor to a Kraft process is, of course, evident and every step is taken to improve the effectiveness and efficiency of steam and and power recovery. The graph shows oil at the 100 level since this is the most expensive of energy sources. Gas; B. C. Hydro and hog fuel are then grouped relative to the oil and the black liquor. These costs are site-specific but at Quesnel, hog fuel and B. C. Hydro unit costs amount to about 5 percent of the oil costs. The strategy for Cariboo Pulp is to maximize hog fuel usage, avoid oil usage altogether and minimize gas and B. C. Hydro purchases.

2.0 POWER BOILER

In the Quesnel area there is a large surplus of hog fuel. Before the pulp mill was built all of this material was disposed of by numerous Teepee burners. At pulp mill construction, during 1970/72, it was considered necessary to have an alternate disposal method to protect the outside chip storage from fly ash and thus ensure top quality full bleached pulp. Fly ash cannot be removed from pulp by present known processes. As a result the design of the mill included a power boiler designed to utilize hog fuel with standby gas and oil capability.

Exhibit 6 shows the side elevation of the boiler. Of interest are the travelling grates to remove ash, the ash hoppers, the overfire and underfire air nozzles; and the flue gas ash removal system. Extensive modifications were completed in 1983 to improve the reliability and uptime of the hog and ash systems. Compared to gas or oil, combustion of hog fuel is not an easy task. Hog fuel contains up to 55 percent moisture, has an uneven size distribution, is bulky and hard to handle, contains a variety of debris, and has an high ash content.

After start-up it became apparent that the power boiler was unable to eliminate the hog surplus in the area and a landfill was used from 1972-1979 followed by the installation of three forced air smokeless Teepee burners centrally located amongst most of the hog suppliers. One or two of the burners are currently in operation.

The Power boiler uses about 180 000 VMU/a and 300 000 VMU are disposed of in the smokeless Teepee burners. VMU stands for Volumetric Unit and weighs 1600 bone dry pounds. One sawmill utilizes planer shavings for lumber kiln drying.

Present pulp production rates require the Recovery boiler to operate at full capacity while the Power boiler is heavily loaded during the winter but has substantial excess capacity during the summer months. The power boiler takes swing loads during interruptions anywhere in the continuous process and has a good turndown capability since the air and feed changes were made in 1983. Expansion plans are underway to increase the pulp capacity by 150 tonnes/day but this will only affect the Recovery boiler for which extensive modifications are planned in 1989.

3.0 COGENERATION

A 28 MW Turbo Generator was included in the design of the mill in conjunction with the Power boiler installation as explained above. The capacity of this Unit was calculated to provide all the electrical power required to run the mill at the design capacity of 700 tonnes/day. A contract with B. C. Hydro was entered into so that 3 MW could be imported to provide power during start-up. This amount was gradually increased during the years to 6 MW. In addition, a 30 MV·A transformer substation was installed in 1979; this enabled the mill to overhaul the Turbo Generator without production loss or to maintain production at full capacity during Turbo Generator shutdowns.

The B. C. Hydro contract includes a demand charge which applies whether any power is used or not and an energy charge for actual power used. Penalties are applied when the contracted amount is exceeded or ad hoc arrangements are made to purchase block power amounts when a planned deviation occurs. The current rate structure does not include any incentive to sell back excess power to B. C. Hydro but is directed towards ensuring that power is available at all times and to encourage the use of large blocks of power at a declining rate. If this rate structure could be revised, to include incentives to sell excess energy to B. C. Hydro, much larger capacity turbo generators would be considered for inclusion in Kraft mill designs.

Exhibit 7 shows the available surplus in MW since start-up. As the pulp capacity increased during the years this surplus has decreased from 5 MW to nil during the last 5 years. In the future we expect that 3 MW will have to be imported on a continuous basis after the expansion plans are completed. An upgrading of the existing TG to 34 MW is another possibility.

What can or should be done with excess hog fuel?

In 1979 B. C. Hydro completed a study to utilize 300 000 VMU of available hog fuel in the Quesnel area to produce 60 MW in a power generating station. Such a station would use hog fuel to produce power and steam to operate the sawmill processes and sell the excess power to B. C. Hydro. The station would have the capability to burn municipal waste and could be expanded if more hog was available. The cost at that time was $60 million. The internal rate of return was 9 percent for a power generating price of $0.03 kW·h. Since the 1979 price of power was calculated to be $0.02 kW·h, the project was not considered to be economically viable.

In 1984 West Fraser constructed a boiler utilizing planer shavings and fines both of which have a low moisture content of about 15 percent to displace the gas burners for their lumber dry kilns by an indirect heat exchanger. No attempt was made to produce power.

In Eureka, Northern California, where a different economic balance exist between power costs, capital costs and power rates, the following installations have been made. The Eureka area is very similar to Quesnel, with lumber, plywood and pulp mills.

Eureka, Cal.- Parallel Generation from Hog Fuel

20 MW	1976	Power and steam for dry kiln and plywood plant
10 MW	1985	TG upgrading, Kraft Pulp Mill
10 MW	1985	Condensing TG, open market hog fuel purchaser
15 MW	1987	Condensing TG, open market hog fuel purchaser
25 MW	1988	Steam for lumber mill, sell excess power
1.5 MW	1988	Gas Turbine - main product carbon black

It is clear from the above that the forest industry can be an interested partner in parallel generation. There are no practical or technical reasons to hold back utilization of hog fuel for power generation. Long range economic considerations and effective rate structures can help to bring this about. It is hoped that B. C. Hydro efforts in parallel generation will open fresh opportunities to the various regions of the Province and that the Quesnel area will be one of them.

KRAFT PROCESS FLOW DIAGRAM

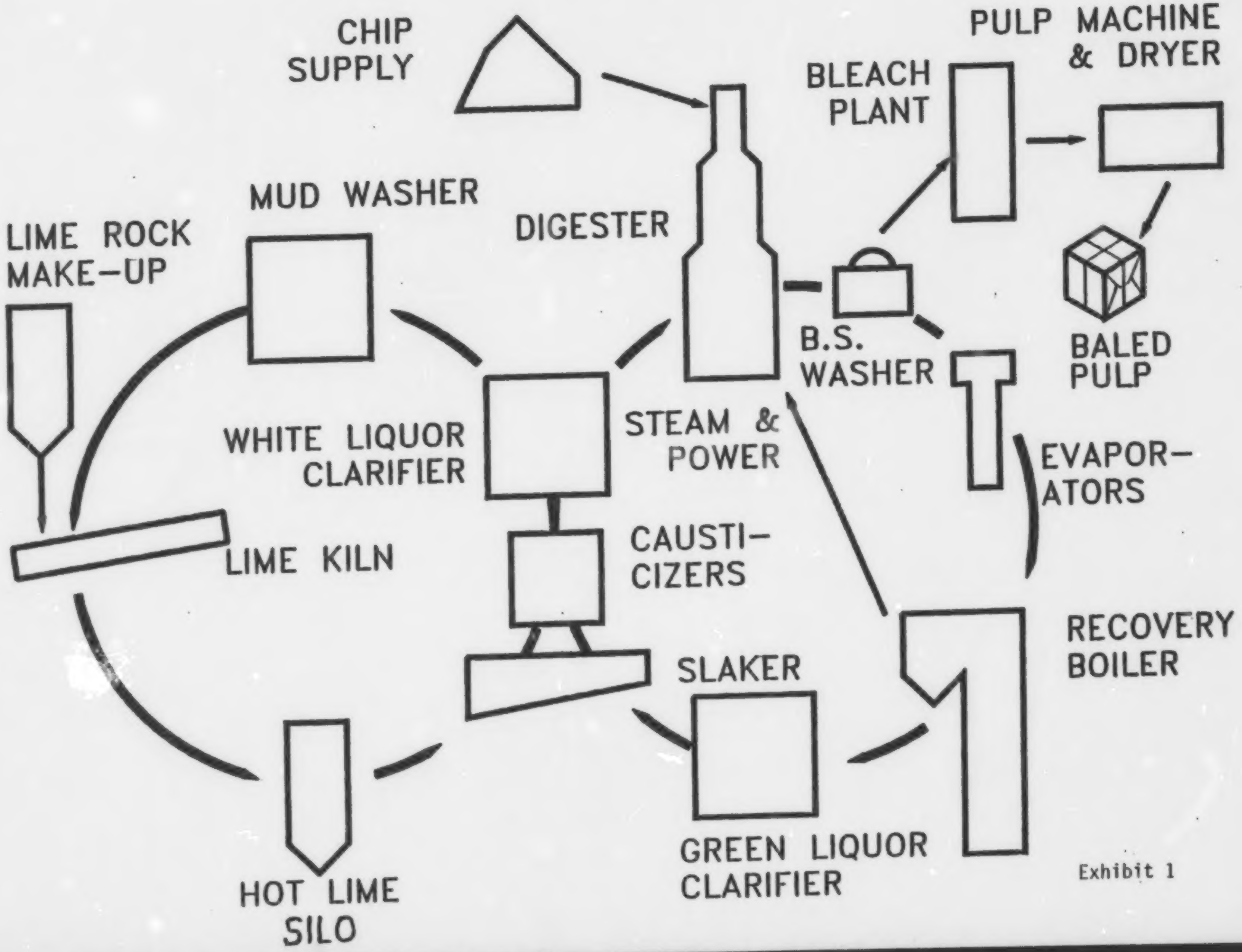
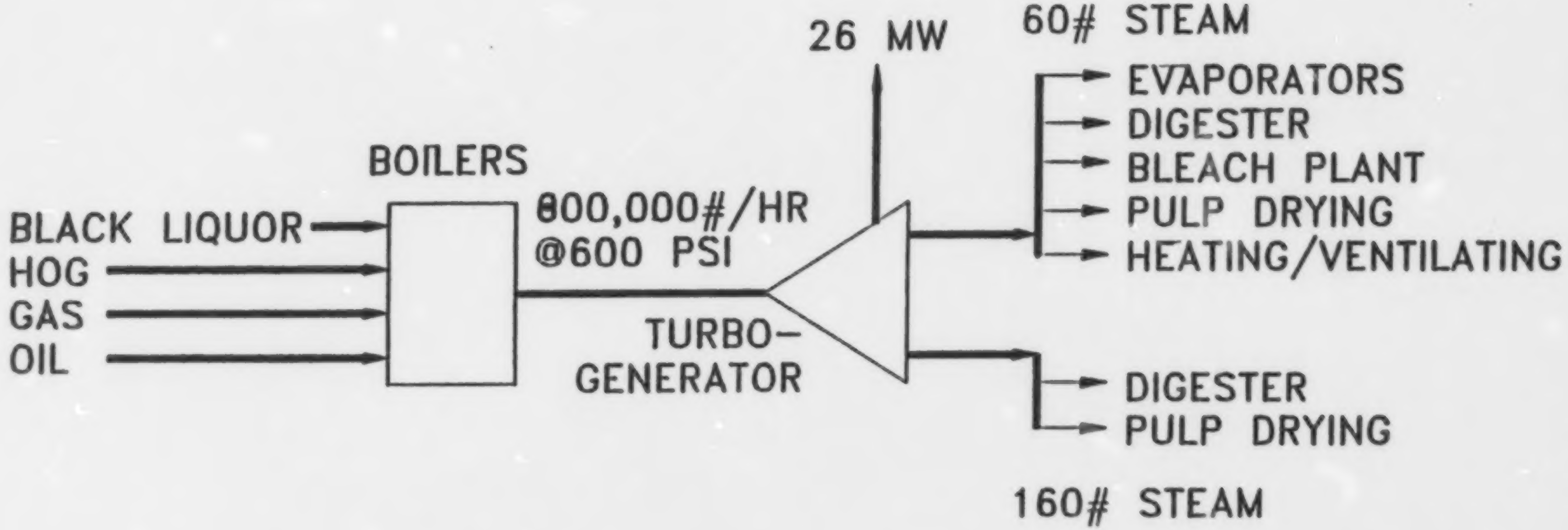

CHIP SUPPLY
PULP MACHINE & DRYER
BLEACH PLANT
MUD WASHER
DIGESTER
LIME ROCK MAKE-UP
B.S. WASHER
BALED PULP
STEAM & POWER
WHITE LIQUOR CLARIFIER
EVAPORATORS
LIME KILN
CAUSTICIZERS
RECOVERY BOILER
SLAKER
GREEN LIQUOR CLARIFIER
HOT LIME SILO

Exhibit 1

STEAM & ENERGY BALANCE



BLACK LIQUOR
HOG
GAS
OIL

BOILERS

800,000#/HR
@600 PSI

TURBO-
GENERATOR

26 MW

60# STEAM
EVAPORATORS
DIGESTER
BLEACH PLANT
PULP DRYING
HEATING/VENTILATING

DIGESTER
PULP DRYING
160# STEAM

Exhibit 2

CARIBOO PULP AND PAPER COMPANY
ENERGY SOURCES
Self generated and purchased

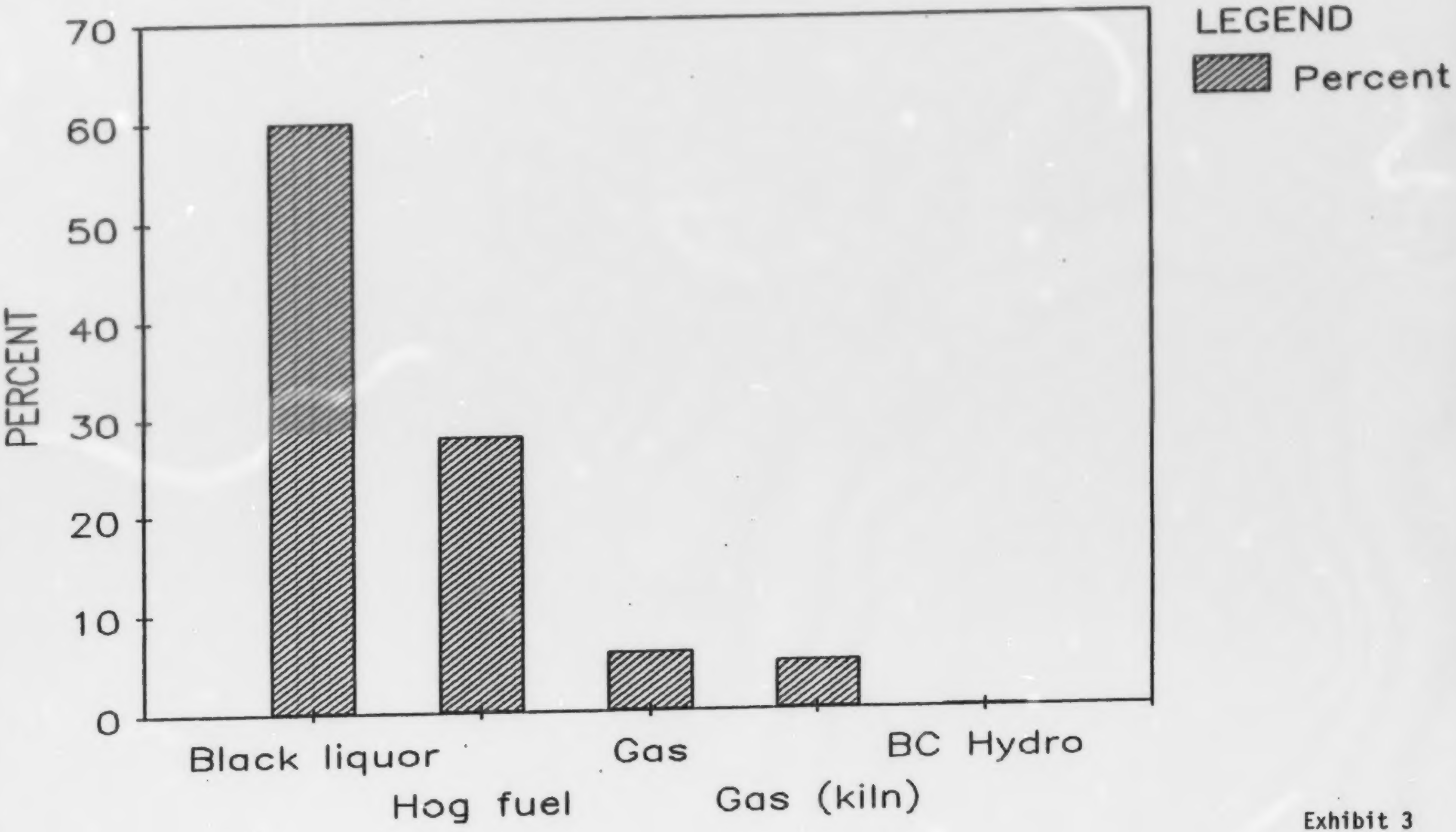


Exhibit 3

CARIBOO PULP AND PAPER COMPANY
SELF SUFFICIENCY
(100% minus purchased energy)

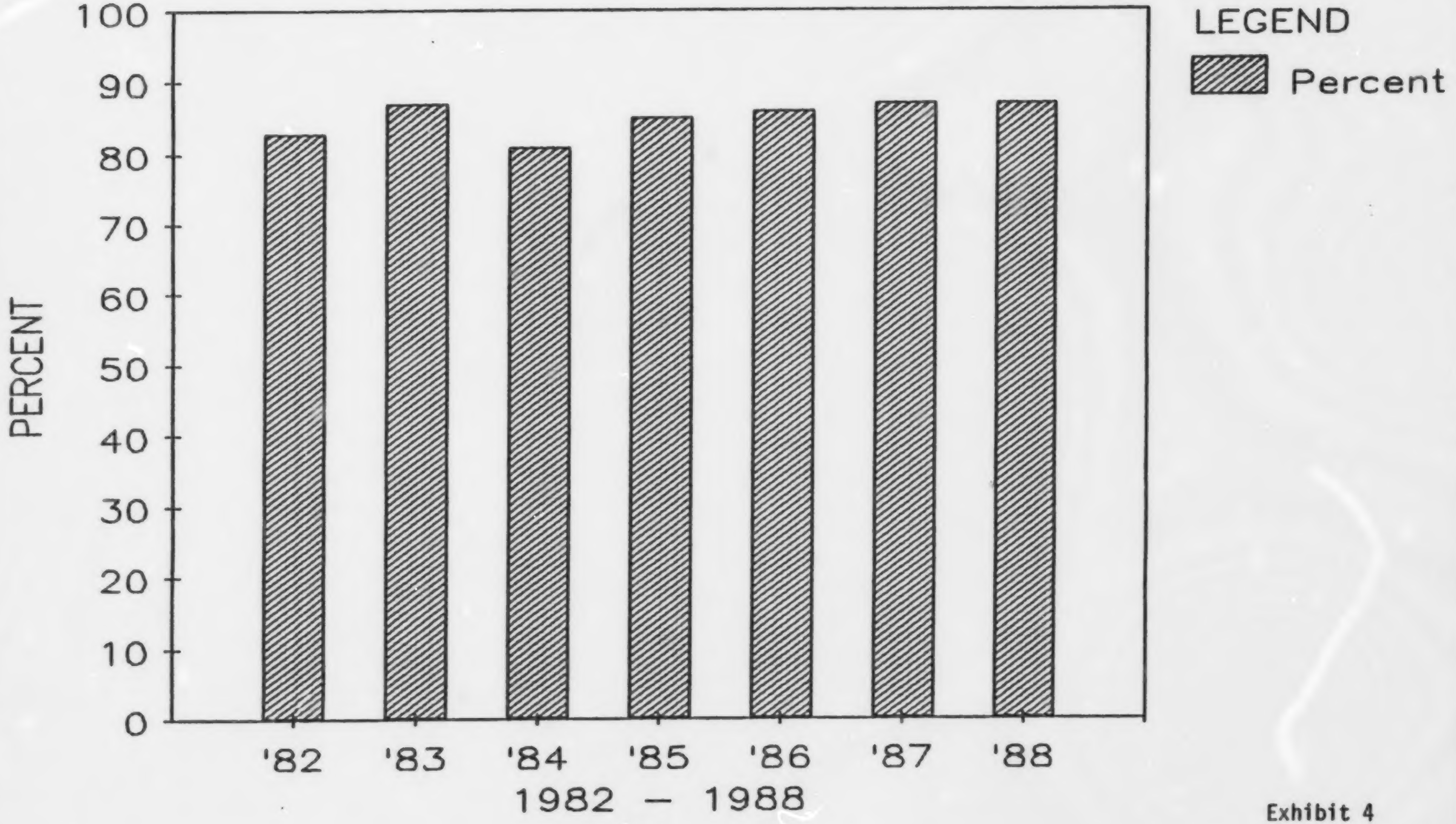


Exhibit 4

CARIBOO PULP AND PAPER COMPANY
RELATIVE ENERGY COSTS
Self generated and purchased

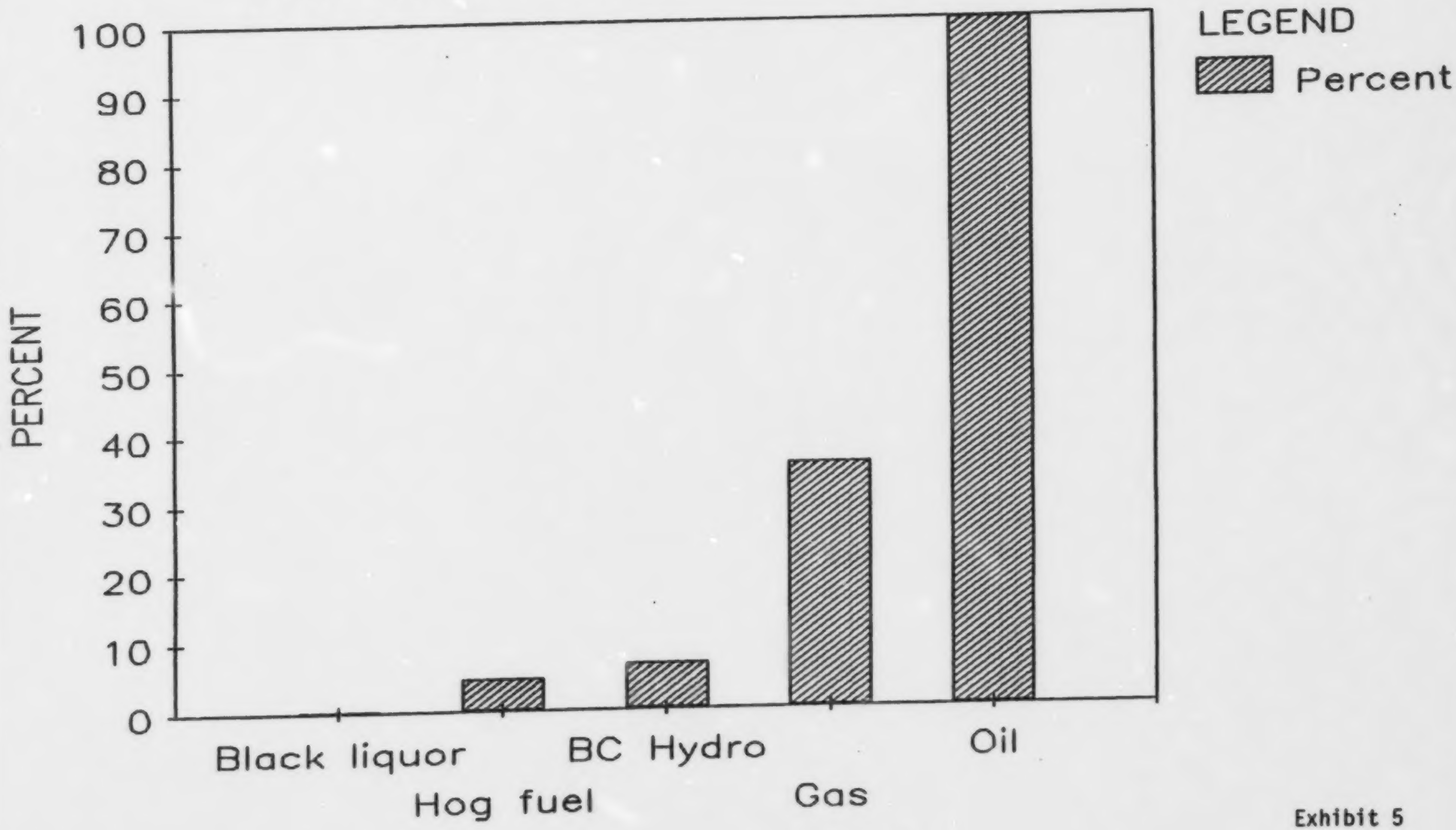
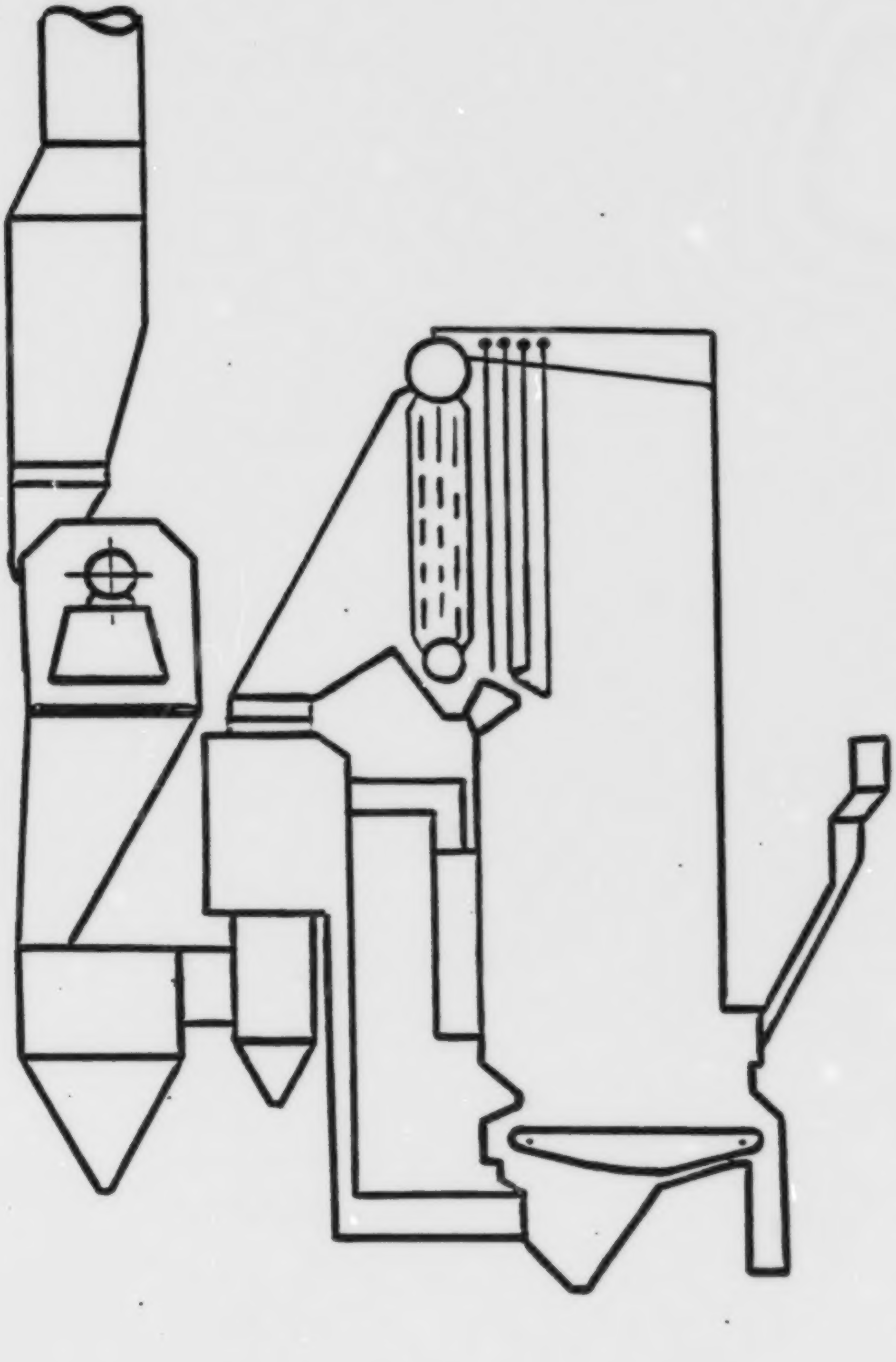


Exhibit 5



BOILER SIDE ELEVATION

Exhibit 6

CARIBOO PULP AND PAPER COMPANY
AVAILABLE SURPLUS — MW

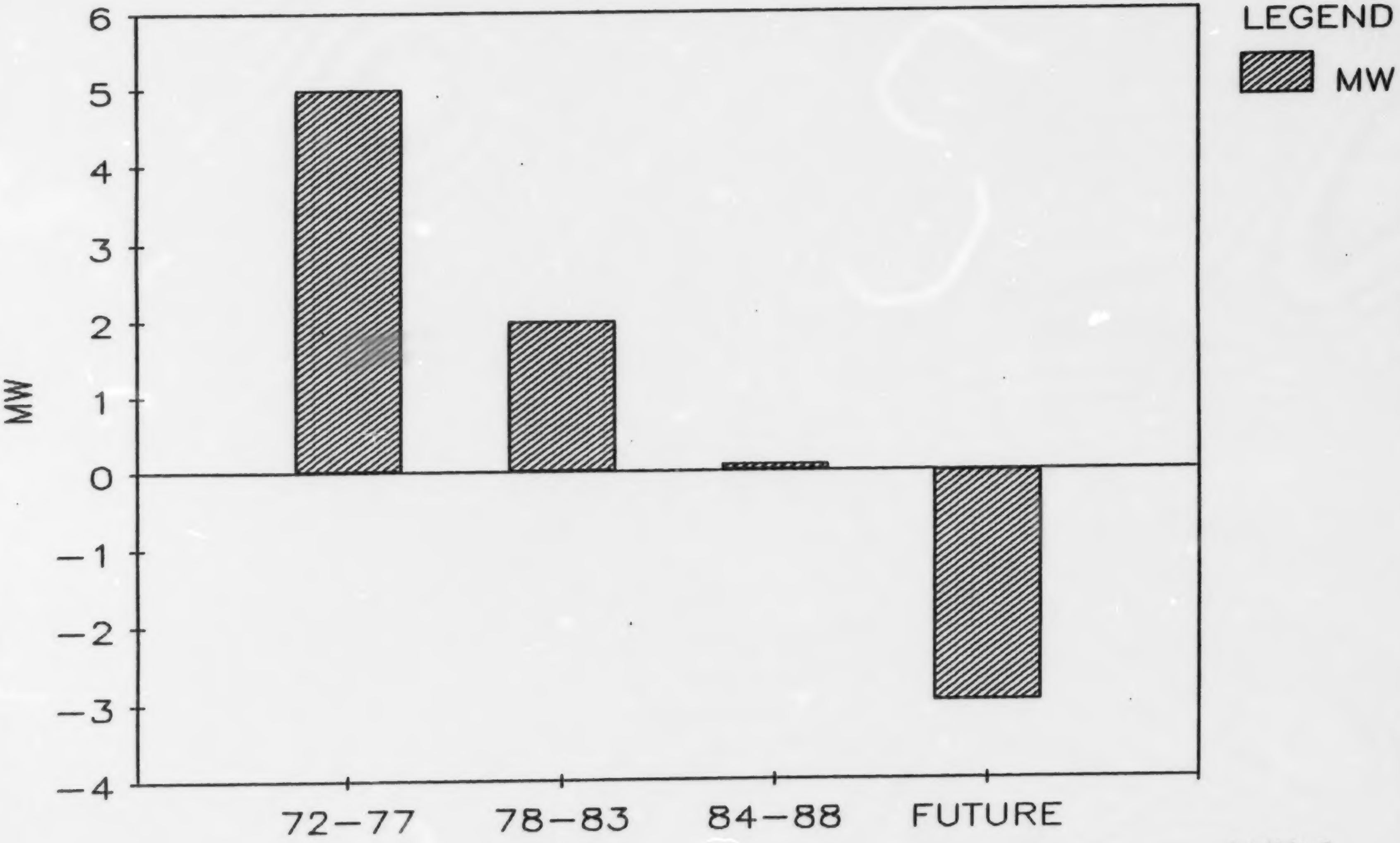


Exhibit 7

PARALLEL GENERATION: PUBLIC'S PERSPECTIVE

(PRE-PRINT)

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Executive Director and General Counsel
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I am pleased to have been invited to participate in this Conference. Having spent a lot of time over the last 7 years in a mainly unsuccessful attempt to pry information out of B. C. Hydro in regulatory hearings and to encourage the Authority to involve the public in its planning process, it is refreshing, if a little disarming, to find myself in this position.

At the outset I must make a couple of disclaimers. Although the title of my talk is "Parallel Generation: Public's Perspective" I do not purport to represent all of the public or indeed all of B. C. Hydro's customers. However, as General Counsel of the B. C. Public Interest Advocacy Centre, I have represented a number of public interest groups - the B. C. Branch of the Consumers' Association of Canada, the B. C. Old Age Pensioners' Organization, and the Federated Anti-Poverty Groups of B. C. - at regulatory hearings and in the ongoing regulation of B. C. Hydro before both the B. C. Utilities Commission and the National Energy Board These groups, who represent a significant cross section of Hydro's residential customers, have been, along with the Council of Forest Industries and other industrial organizations, the major interveners in B. C. Hydro's regulatory hearings. I expect it is for that reason that I was invited to participate in this Forum. However, the views that I express, while to my knowledge are generally shared by my clients, should not be taken as their views but purely my own.

The second disclaimer is that I am a lawyer. I am not an engineer and have no technical knowledge about parallel generation alternatives. Neither am I an accountant or an economist. My perspective is from a non-specialist point of view, but I believe it is not unrepresentative of the perspective of "the public", at least as that term includes B. C. Hydro's residential customers.

Parallel generation is defined by Forum organizers as "electricity generation from an independent power producer's facility which is connected to a utility system. It includes customer-owned generation where surplus electricity may be sold to the utility." This definition can be interpreted narrowly in the sense of covering only non-B. C. Hydro generation utilized to serve B. C. Hydro's domestic customers or broadly to include any non-B. C. Hydro generation which utilizes any portion of the B. C. Hydro transmission system to serve any customer, within or without the B. C. Hydro system, domestic or export. For the purpose of my comments, I will adopt the latter definition.

Public interest groups have, since the inception of their participation in the regulation of B. C. Hydro, pushed the utility to consider alternatives to main station generating facilities, including demand side alternatives and what is now referred to as parallel generation.

In the first B. C. Hydro rate hearing in 1982, I argued on behalf of my clients "There are many alternatives available to B. C. Hydro apart from building major hydroelectric projects to meet future electricity demands....

[including] energy, light and heat produced by conservation, load management, geothermal means, solar energy, cogeneration, small scale hydro, wind, and other alternative energy forms."

In Hydro's next rate hearing in early 1986, we developed this approach further and argued for a new set of priorities for B. C. Hydro.

"In our submission, the Commission and B. C. Hydro should adopt the following priorities regarding resource planning, development, and operations, in an assessment of whether or not Hydro is operating in a least cost manner.

"Priority should be given by Hydro to the most cost-effective resources, and this would mean, in our submission, that Hydro should look to potential sources of supply in the following order.

"First, to conservation resources, whether it's called purchased conservation, supply side conservation, or whatever, but to look at conservation as a source of supply.

"Second, to non-firm resources, so-called, such as increased use of secondary Hydro energy, energy purchases, use of interruptible portions of industrial loads, and other demand management techniques.

"Third, to generating resources using waste heat, or generating resources of high fuel conversion efficiency, such as cogeneration.

"Fourth, to renewable resources, including improvements to, and upgrades to existing hydroelectric stations, and unmachined reservoirs, small hydro, geothermal and wood and wind resources where they may be economic and useful, particularly in the non-integrated areas.

"Finally, to major hydro stations...

"In our submission if B. C. Hydro cannot demonstrate that it plans and operates its resources in accordance with these priorities then it cannot demonstrate that it is operating on a least-cost basis."

Keep in mind that these submissions were made at a time when B. C. Hydro's planning process virtually ignored any alternative other than major generating facilities such as Site C, Hat Creek, Stikine-Iskut and Liard. In fact, a standing joke during the first B. C. Hydro rate hearing was that Hydro's definition of a small hydro project was any project costing less than $1 billion.

My clients strenuously opposed this reliance on major projects. This opposition was based on economic as well as environmental grounds - these projects simply did not make economic sense even without considering the environmental impacts which ranged from unreasonable to unacceptable to, as for example, Stikine-Iskut, inconceivable.

At the same time, we were conscious of developments in the United States, particularly the Pacific Northwest which under the 1978 Public Utility Regulatory Policies Act (PURPA) and related legislation gave priority to more economically and environmentally reasonable alternatives such as purchased conservation, cogeneration, and small projects. We could see no reason why the same approach could not be adopted in British Columbia by B. C. Hydro.

A recent research study undertaken on behalf of B. C. Hydro underlines these concerns. In "Public Attitudes Towards B. C. Hydro", a research report for B. C. Hydro by The Goldfarb Corporation published in February stated that, 74 percent of those surveyed agreed that "B. C. Hydro should be concentrating on conservation and promoting more efficient use of electricity, not building new electricity generating facilities" and 67 percent agreed that "Unless B. C. Hydro's expansion plans for the future are curbed, we are going to have to pay unnecessarily high electricity rates for more electrical power than we will need" (Goldfarb report, page 80).

As the Goldfarb Corporation put it in its "Overview Summary" (p. 0-14), "There is a fair degree of concern that Hydro's expansion plans will cause rates to go up unnecessarily high in order to pay for building generating stations which are not needed for use by British Columbians. There is a concern about possible over building to which Hydro needs to be sensitive.

"There is considerable support for the notion that B. C. Hydro should actively promote conservation or the efficient use of electricity in order to slow down as much as possible the need to build new generating stations."

Given that background, it was with some interest that I read that B. C. Hydro's stated mission is now to support the efficient supply of electricity giving priority to the "Three C's - Conservation, Cogeneration, and Coordination". This is a significant change and a positive one. In fact, many of the options presently being studied are those my clients and environmental groups, such as the Peace Valley Environmental Association, SPEC, and the Sierra Club have been urging on B. C. Hydro for years.

However, the Authority's new approach should not be unrestrainedly embraced by B. C. Hydro's customers. The policy at present is expressed for the most part in generalities. We need more specifics. In my view, a parallel generation policy that makes sense must incorporate at least four factors:

1. The development of parallel generation facilities must be part of an overall planning process.

2. Parallel generation facilities must make economic sense to B. C. Hydro and its customers.

3. Environmental considerations must be taken into account in assessing parallel generation options.

4. Parallel generation should be utilized only to meet domestic demand or to firm up interruptible surplus for export sales.

The development of parallel generation facilities must be part of an overall planning process. It can only be viewed as only one of a number of alternatives available to B. C. Hydro to meet its demand requirements and not necessarily the preferred alternative.

In this respect, we should consider (we including B. C. Hydro, the Ministry, and the British Columbia Utilities Commission (BCUC)) the implementation of a least-cost planning process. This approach is presently in vogue in the United States. While this fact, in itself, is not sufficient reason, as PURPA illustrates, we can learn from the U. S. experience.

The least-cost planning process requires utilities to submit long range resource plans that assess and rank all resource options according to their cost effectiveness. According to a recent study by the Energy Conservation Coalition in Washington, D.C. (A Brighter Future: State Actions in Least-Cost Electrical Planning, December, 1987), 37 states have undertaken 61 different actions - either through legislation, regulation, or studies to explore or promote least-cost electrical planning in the 18-month period from January 1986 to June 1987. Surely the most important goal of a public utility is to provide an appropriate level of service to its customers at the least possible cost to those customers both present and future. I recognize that a Crown Corporation such as B. C. Hydro may be required (and has been required) by government, because of its status as a Crown Corporation, to facilitate other goals such as economic development, but as a public utility its chief goal must be as a least-cost service provider.

One essential aspect of a least-cost planning approach is that it encourages, even requires, public input into the utility's planning process. B. C. Hydro has indicated that it wants to involve the public in its planning process. I, my clients, and other public interest groups look forward to participating in a truly responsive public planning process. But establishing this process is easier said than done.

B. C. Hydro and the government must recognize that effective public participation requires both an accessible process and a public which is both informed and armed with the resources necessary to provide meaningful input.

B. C. Hydro has historically been less than forthcoming with information, even refusing to provide interested parties with materials that could easily be, and were, obtained through the Bonneville Power Administration's open public information process. This attitude no longer prevails. I, and I assume other public interest advocates and organizations, now find requested information and documentation fairly readily available. This Forum is also a positive step although I am compelled to point out that the registration fee of $100.00 is not calculated to encourage public participation.

Most public interest groups have very limited resources. They cannot afford the consultants, expert witnesses, and other support that industrial interveners and utilities command and which are considered necessary in regulatory cases. Until 1984, the BCUC had jurisdiction to, and did, award costs against utilities, including B. C. Hydro, to public interest interveners. That year, the legislation was amended to preclude cost awards. Since then, interventions by consumer, environmental, and other public interest groups have been seriously hampered. We hear a great deal of talk in today's energy environment about "level playing fields". If the regulatory process is to be a level playing field for all participants, the regulator must have the authority to award costs in appropriate cases.

Parallel generation facilities must make economic sense to B. C. Hydro and its customers. There is no point in encouraging the development of alternative facilities and requiring B. C. Hydro to purchase energy generated by these facilities if it can obtain the energy at a lower cost either by developing the facilities itself or more likely through alternatives such as demand side options. For this reason I am firmly opposed to the concept of requiring B. C. Hydro to purchase energy from parallel generating facilities at fully avoided cost, even assuming we can properly define what we mean by fully avoided cost.

A recent glossy publication entitled "The Private Power Option for Canada" prepared by Passmoore Associates International of Ottawa and financed through private sector contributions from potential cogenerators, their lawyers, and other supporters strongly advances this concept. The report argues that "To encourage development, private power generators should initially be paid at a rate that represents the fully avoided cost of new large generating facilities. Once existing excess capacity within a given utility jurisdiction is consumed and a strong private power industry is in place, a bidding process for new capacity can be instituted."

That would obviously be a great deal for the private power industry, but it would be of limited, if any, benefit to B. C. Hydro's, or other utilities' ratepayers. Why should ratepayers support parallel generation if the ultimate cost to them is the same as from B. C. Hydro generating facilities? If the power to be obtained from parallel generation will cost the same as power from Site C there is no economic benefit to ratepayers and, depending upon the nature of the parallel generation facilities, there may not even be any significant environmental advantages.

In the United States, under the PURPA legislation the concept of a utility paying avoided cost for the purchase of energy from Qualifying Facilities has been established by regulation. However, there is some leeway for state regulatory agencies to determine what is included in avoided cost. As a result, the impact of PURPA has varied significantly from state to state. This has given rise to a great deal of debate on the appropriateness of the various approaches and how successful PURPA has been in meeting its stated objectives, as any reader of Public Utilities Fortnightly, and similar journals, will attest. (For example, see Public Utilities Fortnightly, Volume 120, No. 6, 17 September 1987 - which included four articles on this subject.)

I am far from being an expert in utility rate making, but I do believe we have a lot to learn from the experience in the United States. I see no reason why we cannot establish, through a bidding process or otherwise, a price for energy from parallel generating facilities that is both economic for B. C. Hydro and will make a profit for the owner of the facility. The bottom line is this - if it does not make economic sense for B. C. Hydro to purchase the power, it should not do so nor should it be required to do so.

I am particularly concerned with the proposal that private producers may use B. C. Hydro's transmission system to wheel power to new industrial loads, presumably in competition with B. C. Hydro. The experience in the natural gas and telephone industries clearly shows that when competition is introduced into a previously monopoly market, only a few customers, chiefly large industrial users, are in a position to take advantage of it. Residential and small commercial customers, on the other hand, suffer because the utility lowers its cost to potential customers in the competitive market, thereby reducing revenues from that class, and shifts the revenue burden to the captive monopoly. I have no doubt this will happen with B. C. Hydro and I will be monitoring the situation closely.

Environmental considerations must be taken into account in assuming the appropriateness of parallel generation. No generating facility is environmentally benign, whether it be small hydro, a coal plant, or an oil or gas-fired generator. Social costs of pollution and environmental degradation have to be included in evaluating generating alternatives. I, and I believe the majority of British Columbians, are firmly opposed to the construction of Site C for environmental as well as economic reasons. However, the possibility of precluding the building of Site C will not, in itself, cause a rush to embrace some other facility if that alternative facility produces significant environmental consequences.

Parallel generation should be utilized only to meet domestic demand or to firm up interruptible surplus for export sales. I do not support building facilities dedicated to the export market nor pre-building facilities in order to take advantage of perceived export opportunities. Again I believe my views on this issue are consistent with those of a majority of British Columbians.

I want to make it very clear that I am not opposed to B. C. Hydro selling in the export market. In fact, I encourage it and have on behalf of my clients, consistently done so in every Hydro regulatory hearing.

Given the nature of the B. C. Hydro system, it will almost always have surplus energy available for sale and, to the extent that it can sell that surplus in the export market, its customers benefit. In the 1986 rate hearing, I argued on behalf of my clients that B. C. Hydro should take steps to firm up its existing surplus so that it might more profitably be sold in the export market. B. C. Hydro now proposes to do this. However, we proposed that it should use demand side energy not a thermal plant for this purpose.

I have some real concerns about the recently announced proposal to build the proposed East Kootenay thermal plant and dedicate it to the export market.

I remain unconvinced that building for export or "prebuilding" for export makes economic sense, particularly when all costs, including environmental costs, are taken into account. I consider building for export and "prebuilding" for export to be essentially the same thing, particularly where long-term fixed contracts are involved, as the seller cannot ensure that it can reclaim the power when it is required for domestic use. Can the United States market justify building for export without significant subsidies from either B. C. Hydro customers and/or B. C. taxpayers? I doubt it. I do not believe that the California market holds the prospects for future sales that would justify this approach. There are just too many alternatives available to California utilities. California regulators will not necessarily approve long-term fixed price contracts and the ongoing debate over ownership of the Third AC Intertie also raises questions of whether guaranteed access to those markets will ever be available to British Columbia.

There are potential markets in the Pacific Northwest, but that is also a potentially volatile market involving competition with BPA.

In any event, even if the markets are there and access can be guaranteed, I strongly object to despoiling the British Columbia environment in order to provide cheap electricity to run the air conditioners in California or the aluminium smelters in Oregon and Washington.

I particularly object to any B. C. Hydro involvement in building for the export market. Because of the significant risks involved, there is a very real potential that B. C. Hydro's domestic customers will be forced to subsidize its export customers. For this reason, my clients and I, and I expect the general public, will continue to vigorously oppose generation for export.

The bottom line is that the public position on parallel generation is, or at least should be, one of cautious support. I say this cautiously mindful of B. C. Hydro's advice to me that a condensed version of the video tapes of this Forum will be used to promote demand side management and parallel generation among Hydro's employees and customers. I do not want my participation in this Forum to be interpreted as unqualified support for B. C. Hydro's, or indeed the Ministry's, proposals. I continue to support the position that my clients advanced in the 1986 B. C. Hydro rate case and which I quoted earlier. Within that framework and with the economic and environmental constraints I have just mentioned, I believe that parallel generation, together with other supply side, and demand side, alternatives, should play an important role in B. C. Hydro's system planning.

I, for one, look forward to being involved in that planning process.

MAKING PARALLEL GENERATION HAPPEN

CALIFORNIA'S EXPERIENCE

(EDITED TRANSCRIPTION)

BOB MUSSETTER

Commissioner
CALIFORNIA ENERGY COMMISSION
Sacramento, California

Greetings from California, the land of the fruits and nuts. After Arie's presentation it is only fitting that you learn about parallel and cogeneration from a Californian. There are five Commissioners on the California Energy Commission, a lawyer, an economist, an environmental scientist, and an engineer, but I am the public member which gives me complete freedom, that means I do not have to know a damn thing. The one thing that I do know is it is painful to pay high electric bills. I was involved in paying those bills and still am for a ranch, a city, a small business and of course for my own personal residence full of kids. So in California, where we talk in cents rather than in mills, the price of power is a major issue. The California Energy Commission was created in 1974. The Public Utilities Commission, another similar body, was created in 1910, to regulate the giant octopus, The Southern Pacific Railroad, and since SP was headquartered in San Francisco, the PUC was headquartered there too and is still there. It regulates the rates that can be charged by the Pacific Gas and Electric Company, The San Diego Gas and Electric Company, Southern California Edison Company, and Southern California Gas Company which are all in the energy field. It also regulates the rates of the telephone companies, the trucking companies, the railroads, some of the bridges and ferry boats. They are into everything. So the Energy Commission, in response to the oil situation that emerged in the early 70s, came into being or was created by legislation that was modelled or patterned on the Rand Corporation, a think tank in Santa Monica. The Rand Corporation Study was a $500,000 contract to tell the California Legislature and the then Governor Reagan, what should we do about energy, should we be getting more involved in the planning process, etc. and the Energy Commission came out of that.

I use this word "small" in quotes when I refer to independent or non-utility generation. I suppose there are a dozen words that could fit in there, small is no more appropriate than any of the other ones. If you call 300 or 400 MW small then it fits. We find that we have energy plants ranging from a few kWs all the way up to the large nuclear plants. We have never licensed a nuclear plant before our Commission in its history, but the process is in place.

The California market is about four or five times bigger than the B. C. market. We are approaching 200,000 GW.h a year now. We may shortly reach that. We have about 42,000 MW of peak demand and we probably have 55,000 MW or more available to fill that demand, so we have a substantial reserve margin, more than most utility experts claim is necessary (Exhibit 1). We will get into the reasons for that in due course. We have approximately 28 million people in the State which is a little greater than the population of the whole of Canada. It is not abating. People are flooding over the borders from all directions. Where you have jobs, people follow jobs. They will live as close as they can afford to live to their work. In the Los Angeles and the southern California basin people are moving inland because the price of property is just too expensive and they are commuting long distances from places like Riverside and San Bernardino to get to work in Orange

County and even downtown L.A. This causes terrible traffic congestion where the freeway system just cannot cope.

You may have noticed that Vice President Bush, the presidential candidate for the Republican party, last Sunday, in Los Angeles, announced that a policy of his candidacy was going slow on off-shore oil drilling off the coast of California. Of course, it is very important for him and his campaign effort that he carry California and this was a calculated strategy, but nevertheless, he was able to do that because he was at the Energy Commission dedication of an Arco Service Station on Wiltshire Boulevard which featured the first installation of a methanol pump. Arco and Chevron have both come aboard our methanol fuels program which has been taking a heck of a lot of dynamite between the oil companies and the automobile manufacturers. It has been difficult to get that door open, but it is open. I know that natural gas is used to a great extent and we think that is fine too, but we have just seen that it is difficult to penetrate that automobile market. California is the third largest gasoline market in the world. The only two political subdivisions that use more gas than California are the entire United States and the entire Soviet Union. It is a ridiculous situation, so we have been pushing methanol and we think that it will give us a way of making headway in becoming less dependent on oil. Our transportation sector represents about half of our energy consumption and it is entirely dependent on petroleum. We need ways to get away from that. Florida has come out with a flexible fuel vehicle which will burn either unleaded gas or methanol in any combination. If you get to a place where you cannot find methanol you just put unleaded in and go on your merry way. A computer under the hood calculates the percentages of the two fuels and ensures the correct quantity is being injected through the injection system and the timing and the rest of it is also correct. They are good cars. There are only a few, about 30 experimental ones have been made so far by Ford, but now GM has been forced to come along and they have some out. We think that 5,000 will be built by Ford next year. We are looking forward to large intrusions of those cars into fleets and then into private hands.

The energy industry in California is a $69 billion a year industry. I want to talk about quantity, price, diversity and efficiency (Exhibit 2). Exhibits 3 and 4 are maps of PG&E's service territory; do not try to read all this, it did not reproduce, but it does not make any difference. That just gives you an idea, each one of those spots is a so-called small powerplant that is operational today and there are so many of them that they had to be categorized. There are thermally-fired ones, hydro, wind, solar - you could not put them all on the same map because you could not even read the map even if you had a good copy. There are a lot of these in California, that is the point. There are 3,000 MW here and the word short range refers to an existing batch of contracts which are outstanding at the present time. Those contracts were set by the Public Utilities Commission and the utility companies were obliged to contract with private power producers with prices set by the Public Utilities Commission. You just heard about the response to this type of thing. If you take the public advocacy lawyer and mix his message up with the message from the small hydro producer, and then get a big wad of politics involved in it, and you get another oil price hike, you will run the risk of coming out of this the way we have. Now that is my real message.

Let me give you some essential figures. We have 55,000 MW of capacity and only 42 are needed (Exhibit 2). We had that same situation three years ago. It was known because we had two big nuclear projects and other projects that were being completed and put on line. Not withstanding, because of ideology in my opinion, the then PUC extended offers to the public, a request for proposals to build power plants. They had four different offers and each one of those had some options within it. So, it is a little complex. The point is that they just held these offers out there and economic conditions changed while they held them out. Well, in business, if you do that, and the economics change in your favour, you are going to create a stampede and that is just what happened. So between 15,000 and 16,000 MW of contracts were picked up by the public and executed. These are still in force, and 5,000 MW of those are on line today. There are still 10,000 more that are either in the permitting process or running around frantically trying to get financed, trying to beat the five year deadline that each of those contracts have. Those contracts will run out in 89, 90 and 91. Now the battle is on because we have created a subsidized industry. They can afford the best attorneys, consultants, economists and lobbyists in the legislature. They do not tell the whole story. They do not want to talk about price. When you do that it is no different than agricultural subsidies or any other kind. You create something then becomes very difficult to manage in any rational way. Now I am not against small power plants. I am not against cogeneration; I am in favour of it. But I am also hard-nosed and I do not want to be paying some guy a subsidy. I do not believe in cross subsidization. I want the cheapest and lowest cost option and that is very difficult to achieve, but it can be achieved. We did not do it. The overpayments in connection with these contracts are going to run somewhere unofficially between $3 and $7 billion present value. We are a big economy, but it is not a good deal for us to be packing that extra load even as big as we are.

Now this is something that most speakers would not show you because every one of these figures can be attacked (Exhibits 5 and 6). But I still maintain that these are ball park figures and you probably will enjoy them. This is nothing but a continuum of dollar per kilowatt costs that has come to my attention and to our attention at the Commission in the process of siting plants and other processes. At the top of the spectrum around $3,000 a kilowatt are the windmills, the solar. We have some large solar projects in the desert, San Bernardino down close to L.A., going into Edison's territory. My Commission just voted two weeks ago to licence a 150 megawatt facility there. The parabolic trough mirrors collect the heat and concentrate and focus it on a tube that contains a fluid. The fluid goes to a steam generator and from there it is more or less conventional. Each one of those occupies a quarter section of land, 160 acres, and they are building them down there by the square mile. They are paying them nine cents a kilowatt hour. It obviously does not work unless the sun is out, but they have twenty-five percent extra that they can fire with gas. So this lets them keep going into the evening and start a little earlier and stretches out the time period. The Diablo Canyon Nuclear plant of PG&E is still being discussed at the PUC. They are deciding how much will be considered reasonable and prudent to include in their rate base, but they invested approximately $5.8 billion for 2,600 MW. It took them the better part of two decades to bring it on line. The Edison Company's analogous unit at San Onofre, which is on the coast between Los Angeles and San Diego, has a little less than 2,300 MW. It is jointly owned by Edison and a few others, principally San Diego. I put this thermal plant in because it is in my home town and I happen to know something about some of the economics. It is a good indicator of a solid fuel burner. They have a very nice, homogenous agricultural waste material, rice hulls, to burn and there are plenty of them. I think they are going to burn close to 300,000 tons of those things a year and once they get it started with gas it will carry on exclusively on the rice hulls. The original plan was to build 25 MW for $25 million. By the time the smoke clears it will cost over twice that much. They have one of these standard offer contracts. It is an indicator that the contracts are very lucrative is it not, because the doubling of the cost did not slow them down for one minute. Balsam Meadows is one of Edison's, one of the few hydros that have been constructed recently. We just dedicated it this week and it is interesting. It is 200 MW, costs $300 million which was the forecasted price. So it cost $1,500 a kilowatt. Edison will spend one percent of that $300 million or about $3 million on environmental mitigation of various kinds. In the old days they would have bored holes through the granite and dumped all of the rock into the stream and let nature take its course. They were not allowed to do that this time. The environmentalists are making them take the topsoil and all the trees and shrubs out of a whole little valley, set it to the side, reroute the stream around the side, then put the rock in, bring the topsoil back and plant new trees. Maybe one percent is a reasonable amount of the ratepayers money to spend on that sort of thing. It is just part of doing business in California today.

Next is the more cost effective generation. There is the Arco Watson Refinery which is a 385 MW cogenerator in an oil refinery. There are oil company operations in the oil fields, but it is more expensive, primarily due to more pollution control equipment; it is in the Los Angeles basin. There is also more control equipment for the electric generating side itself because in a refinery they must have a reliable operation. So that difference of about $300 per kilowatt is due mostly to equipment for either pollution control or operations. Chevron in El Segundo was built at about the same cost, it is another refinery in southern California. The Chevron Richmond plant was postponed by PG&E, who obtained permission from the Utility Commission to make a deal which prevented this bypass of the system. The bypass would affect other ratepayers who are left behind because of a reduced rate base and PG&E was in danger of having a number of its largest customers leave. The small, the core ratepayer, the home owner who has no alternative, no place to go, was going to end up paying more in this case. Although the rate is probably very close to PG&E's variable cost, the project was delayed for as much as five years. After that it will not be as critical to PG&E.

Edison is a very aggressive utility. It is a large company. They were able to move quickly and made a decision years ago. If you cannot fight them, join them. They formed a subsidiary company, Mission Group, and then under that they have Mission Energy which will do turnkey jobs for you. They will licence, design, build and finance a cogeneration plant. They will be glad to come here and do it for you and they know what they are talking about. They are in Virginia bidding on Vetco's tenders. Their RFPs were successful last year in Virginia. A cogeneration plant was built in the middle of the Kern County oil fields. They had to steam the sticky oil out of the ground by shoving steam down which reduces the viscosity of the oil so that it becomes fluid enough to economically pump to the surface. Edison was in a position, because of these big plants, to purchase sixteen Frame Seven generator turbines from GE at a very good price. They made a tight contract with Fluor Corporation and got both of those plants built for approximately $165 million for 300 MW. They say they can do it again.

The Cott Project is based on my own figures of about $700 million for 1,600 MW.

We have a battle in our State now between the independent generators and the utilities who would like to be able to reach up and get some of your power because its cheaper for us. The main attraction is its cost. We need that to blend with our more expensive power sources, partly because of mistakes we have made, which I freely acknowledge because I did not make them.

We have a staff of 400 at our Energy Commission, so we have people who only examine bids from other parts of the country. The city of Springfield, Missouri recently bought a gas turbine for $182 a kilowatt. When you look at something like that you have to examine what they really bought. Frequently, in a case like this, you will find that all they got was the machinery and then their own crew went in and put it together. It may be a little misleading in that sense to put it there, but the same folks that follow these things are telling us that there are even more economical prospects. GE has a new generation of turbines. They are going to be very economical and reliable, particularly for your remote sites. A dispatcher has many choices in one of the big utilities in California. There is hydro, gas, biomass, Rancho Sacho is nuclear in Sacramento, Diablo Canyon and so on. I do not have time to go through all that, but we probably have more choices than you think.

I would also like to rebutt some of the message Mr. Lovins gave you yesterday (Exhibits 7 through 12). California is now saving. I have the luxury of this big staff. We have a specialist and he has a little staff under him and they do nothing, but try to quantify how much California is saving through conservation measures and energy efficiency. They indicate that we are saving about 20,000 GW.h a year and about 7,000 MW of capacity. That 7,000 MW is three Diablo Canyon's or that could be $15 or $16 billion of investments saved. The 20,000 GW.h is about ten percent of our energy use.

We have the cooperation of the building industry, the building officials, generally the architects and the people who do the design work to meet the code. It is still a battle. Builders do not want to raise the prices of their houses. They know that there is a very critical threshold there. Many people in California cannot afford their first house until they are almost 40 years old, or maybe a little past, because of the high price. The building industry is very sensitive to that. I think we have convinced them that we are serious about working with them. We are simplifying these standards. The point is energy efficiency is out there. It is disbursed everywhere. It is not easy to extract and it takes a persistent effort. We are not going to give up. We have taken the easy stuff now and from now on it is going to get harder and harder and this is what you would expect from your own experience. You have not taken the easy stuff, because you have talked about saving 3,000 GW.h a year. That to me is a reasonable goal, but the implication behind that was that you have not really saved much at all. As Cavanagh says we would like to see you go ahead and save that because you would free up some more surplus for us.

I would say in conclusion do not set prices without putting a quantity limit on it, it would be better for all of you. That is the mistake California made. It is not so bad if you set high prices and bring in a few plants, you can probably stand that, but if you just open the door, and hold it open for a year or two with your eyes shut, not paying any attention to what is going on, you are going to have a hell of a bill to pay. So, keep the two things together.

I think efficiency measures probably are your best bet initially, but there again it is not easy, because you will meet a lot of resistance everywhere in the construction industry. The other day we approved three micro-computer programs, software packages, and there is fighting every step of the way on those kinds of things. You cannot build a subdivision or a building in California without hiring a guy with a computer to model the whole thing for you to make sure it will comply. There is a point system and you must have so many BTUs per square foot and no more.

The other part we are concerned about is the dependency on natural gas. We think there is a lot of it out there. Even so, it is worrisome to see the trend because we were down below thirty percent dependency on gas for electric generation and then the prices dropped just when I was appointed in early 1986, and I take credit for all of that. In those two years we went back to maybe forty or a little above forty percent gas-fired generation. We have licensed a bunch of cogeneration plants (Exhibits 13 and 14). The economics work out so that the dispatchers have started firing up those old gas plants. There are 21,000 MW of those in California.

CALIFORNIA'S EXPERIENCE WITH "SMALL" POWER PLANTS

by : Robert Mussetter, Commissioner (Public Member)
California Energy Commission
Sacramento, California
Presented June 10, 1988 at Vancouver, British Columbia
First Annual Electric Energy Forum
Sponsored by B.C. Hydro

SIZE OF CALIFORNIA MARKET

42,000 MW - 190,000 GWH PER YEAR NOW; 233,000 GWH 1997 (ELECTRICITY REPORT 7 DEMAND FORECAST)

28 MILLION PEOPLE NOW; 35-40 (36.4) MILLION BY 2005

WORLD'S SIXTH LARGEST ECONOMY IN GNP

$69 BILLION INDUSTRY

IS MORE THAN THREE TIMES CALIFORNIA'S AGRICULTURAL INDUSTRY.

NEARLY HALF OF THE ENERGY CONSUMED IN THE STATE IS USED IN THE TRANSPORTATION SECTOR

MAJOR TOPICS

QUANTITY

PRICE

DIVERSITY

EFFICIENCY

Exhibit 1

CALIFORNIA'S EXPERIENCE WITH "SMALL" POWER PLANTS

QUANTITY -

PG&E MAPS

"TAKE LITTLE BITES" - LIMIT QUANTITY

WE DIDN'T DO THAT; PRICES OFFERED ELICITED SIGNED CONTRACTS TOTALLING 15,000 MW, WHICH IS 'WAY MORE THAN WAS NEEDED (cf. 42,000 MW PEAK CAPACITY)

PER FIGURES (GO THRU MAY 25 REPORT)

PRICE -

SEPARATE PRICE FROM QUANTITY AT YOUR PERIL

SCALE OF PLANT COSTS

SOLID FUEL VS. LIQUID FUEL

CALIFORNIA CONTRACTS - CPUC/PURPA
Some fixed prices; some variable
Juice in the fixed prices when mkt.
declined.

ELFIN RUN SIMULATES DISPATCHER(S) SCREENS SHOWING CHOICES AND POSSIBLE DISPLACEMENT OF CHEAPER SUPPLIES DUE TO "MUST RUN" BASE LOAD CONTRACTS.

SPOT VS. LONG TERM; WHAT WE MIGHT DO;

50-50 IDEA, as modified by

the BUSINESS CYCLE

OIL PRICE SWINGS

Exhibit 2

PACIFIC
OCEAN

Exhibit 3

OPERATIONAL PROJECTS
UNDER CONTRACT WITH
PGandE

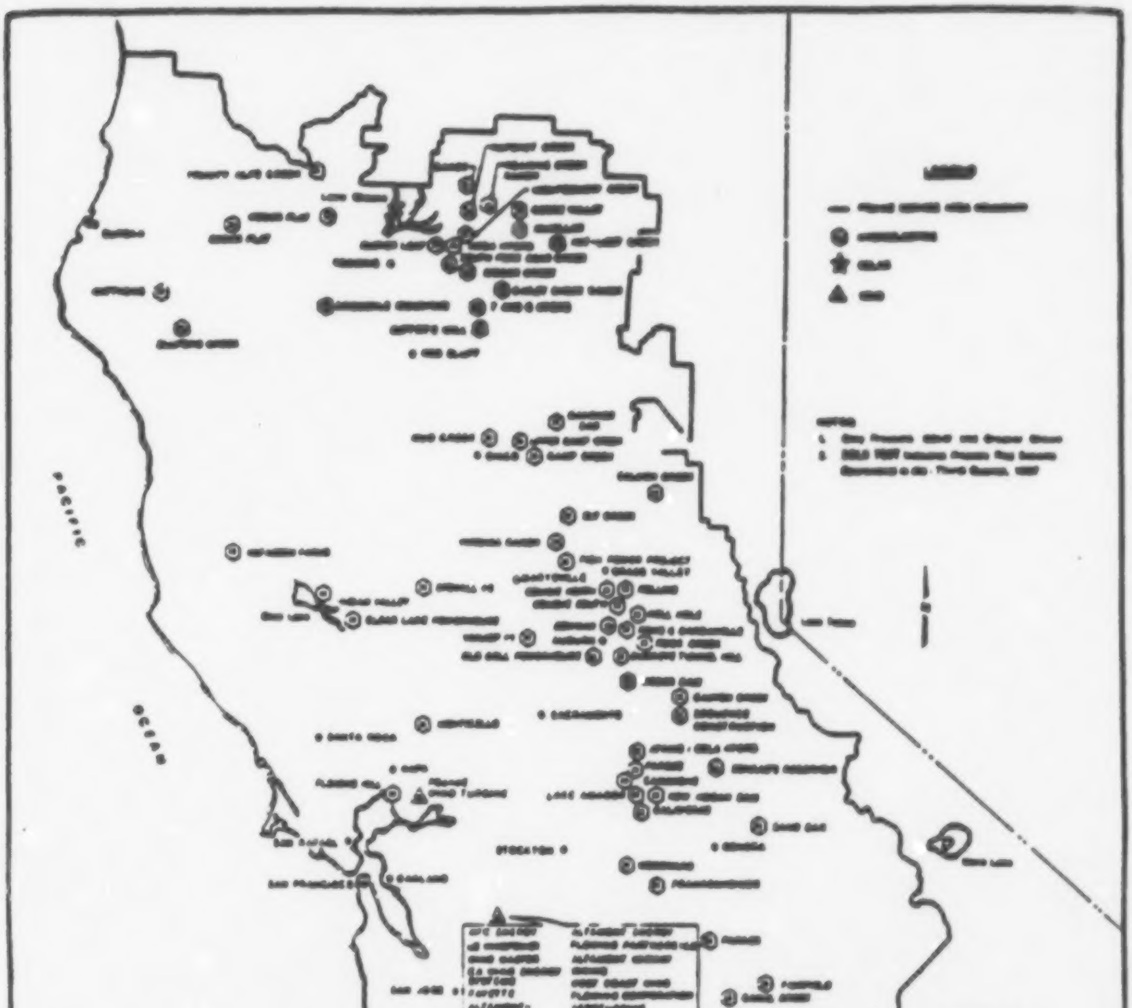
PACIFIC
OCEAN

Exhibit 4

OPERATIONAL PROJECTS
UNDER CONTRACT WITH
PGandE

PLANT COST PER KW

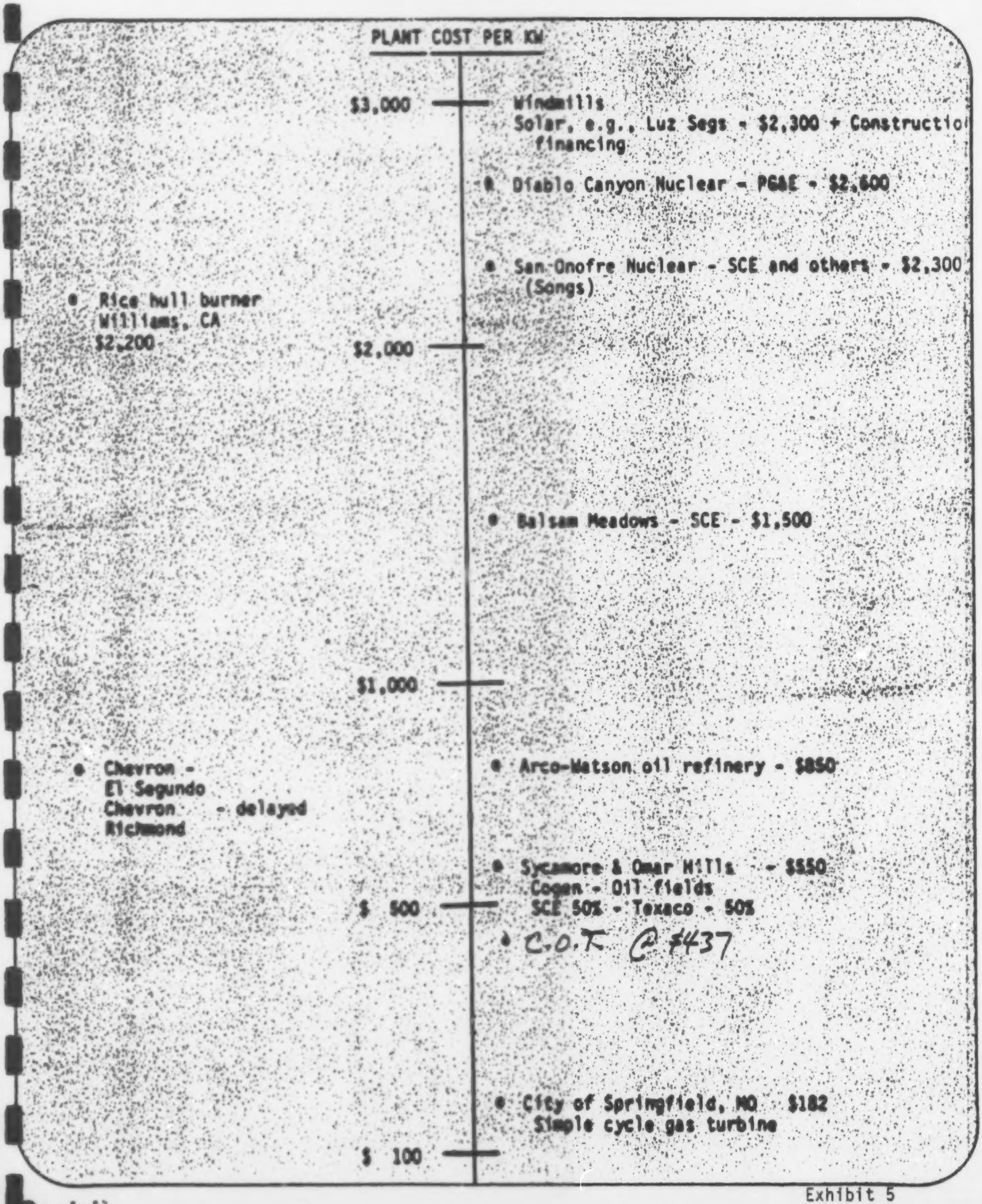

Exhibit 5

SHORT-RANGE LTBA FORECASTS (in MW)
JURISDICTIONAL AND NON-JURISIDCTIONAL PROJECTS

PGandE SERVICE AREA[1]

Technology	Actual 1987	Forecasted 1988	1989	1990
Cogeneration[2]				
jurisdictional	191	311	496	496
non-jurisdictional	888	1,121	1,266	1,379
Biomass[3]				
non-jurisdictional	107	204	221	230
Landfill[4]				
non-jurisdictional	39	43	44	45
Wind				
non-jurisdictional	636	661	708	774
Small Hydro[5]				
non-jurisdictional	98	130	150	165
Geothermal				
jurisdictional	80	80	80	80
non-jurisdictional	1	1	1	1
Solar				
non-jurisdictional	7	7	7	8
MSW				
non-jurisdictional	0	1	2	3
All Technologies	2,047	2,559	2,975	3,181

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[1] All capacities are nameplate capacities, and are defined as of the end of the second quarter of the year. Comparisons with other forecasts should be made with care.

[2] Includes biomass-fired cogeneration facilities.

[3] Non-cogeneration applications only.

[4] Includes digester gas.

[5] Excludes cooperative projects developed by municipal water agencies and electric utilities.

Exhibit 6

CALIFORNIA'S EXPERIENCE WITH "SMALL" POWER PLANTS

INFLATION - POLITICAL PARTIES

PRESENT TENDENCY IS TO RELY ON SPOT
BECAUSE IT'S CHEAP

SETS US UP

We could foster a bulk market that would establish the premium (fluctuating over time) for long term over spot contracts, similar to differentials between short- term and long-term interest rates. In parallel, inverted prices might signal trouble.

Logic tells us we should encourage contracting more supply long term in low part of the cycle; increase proportion of "spot" during high cycles. Hard to do in practice. Companies tend to let things slide in low priced periods, rely on spot; then, when inflation hits, they contract long term somewhere near the top of the cycle. This gets to the essence of the difference between the public's interest vs. a company's (short-term) performance interests.

Question: Can public regulatory machinery muster the wisdom to prescribe such a thing?

Partial
answer: At minimum, I feel a dialogue is healthy.

Exhibit 7

CALIFORNIA'S EXPERIENCE WITH "SMALL" POWER PLANTS

DIVERSITY -

What price?

Insurance policy, but what does it cost, and are there cheaper alternatives?

GAS CURTAILMENT, SOUTHERN CALIFORNIA, DEC/FEB

SoCalGas was only about 38% dependent on spot, yet got in a jam. Other factors: hot summer; dry hydro; gas market disruption; population increases.

STATE'S GAS DEPENDENCY (FOR ELECTRIC GENERATION) HAS MOVED UP FROM BELOW 30% TO ABOVE 40% (+/-), IN TWO YEARS. This is the result of cogeneration plants coming on line as well as utility short-term buying decisions in dry hydro years.

SUMMARY OF TECHNOLOGIES IN MEGAWATTS -
Statewide. (2 overheads)

Exhibit 8

CALIFORNIA'S EXPERIENCE WITH "SMALL" POWER PLANTS

ENERGY COMMISSION JURISDICTION 50 MW

AUXILIARY LOADS
MULTIPLE OR PHASED PROJECTS (TIME & DISTANCE) REGS.

HISTORY OF LICENSES GRANTED BY CEC 50 MW

(OVERHEAD)

Exhibit 9

CALIFORNIA'S EXPERIENCE WITH "SMALL" POWER PLANTS

CURRENT CROP OF CASES BEFORE THE CALIFORNIA ENERGY COMMISSION

BASIC AMERICAN FOODS, KING CITY

10 INCH 37 MILE GAS PIPELINE NEEDED TO SERVE PLANT; WAS NOT FORESEEN BY LDC - PG&E WHO WAITED TILL PLANT WAS LICENSED BEFORE GETTING DOWN TO THE BUSINESS OF FIGURING OUT HOW TO DELIVER 300 PSI 30 MMCFD. THIS IS A "PETITION TO AMEND".

COSO

U.S. NAVY AT CHINA LAKE EAST OF THE SIERRAS
GEOTHERMAL
STANDARD OFFER 4 CONTRACTS; CECI & EDISON CO.
THREE CLUSTERS OF THREE 25 MW PLANTS; 225 MW
TRANSMISSION
SECURITY
FEDERAL LAW VS. STATE LAW
ENVIRONMENTAL CONCERNS

SANTA MARIA

"DIRT BURNER"
50 MW
SANTA BARBARA
OFFSETS: MORRO BAY $20 MILLION

ARGUS

KERR-MCGEE
COAL: ATMOSPHERIC CIRCULATING FLUIDIZED BED
90 MW
DEMO PROJECT

COOLWATER

SOCAL EDISON CO. & OTHERS
DEMO PROJECT
COAL GASIFICATION/METHANOL BYPRODUCT
100 MW

Exhibit 10

CALIFORNIA'S EXPERIENCE WITH "SMALL" POWER PLANTS

CROCKETT
- SUGAR REFINERY COGEN
- 246 MW
- COMBINED CYCLE
- CARQUINEZ STRAITS
- ENVIRONMENTAL
- NEED IN PG&E TERRITORY
- STANDARD OFFER 4, MODIFIED
- DELAYED

GPPL (GEOTHERMAL PUBLIC POWER LINE)
- GEYSERS (LAKE CO.) TO SACRAMENTO
- SMUD AND OTHERS
- MOST INTERVENORS
- NEED
- PG&E VS. MUNIS

LUZ
- SOLAR THERMAL COLLECTORS A MILE SQUARE
- SAN BERNARDINO COUNTY
- 30 MW PER UNIT; 150 MW TOTAL IN FIRST PHASE
- PARABOLIC MIRRORS
- GAS AUGMENTATION 25 %

SHELL
- TEOR
- 60 MW (20+20+20)

Exhibit 11

CALIFORNIA'S EXPERIENCE WITH "SMALL" POWER PLANTS

EFFICIENCY IN CALIFORNIA

THE STATE IS SAVING:

20,000 GWH/YEAR (A LITTLE BETTER THAN 10% OF CONSUMPTION)

7,000 PEAK MW (3 DIABLO CANYONS = @ $15 BILLION OF CONSTRUCTION COST OF NUCLEAR; PERHAPS $5 TO $10 BILLION OF INDEPENDENT PLANT COST.

BALLPARK FIGURES

WE'VE TAKEN THE EASY, BIG BITES; YOU PROBABLY HAVEN'T.

I DIFFER WITH ENVIRONMENTALISTS WHEN THEY OBJECT TO EVERY FEASIBLE PROPOSAL THAT INVOLVES CONSTRUCTION.

I DIFFER WITH THEM WHEN THEY TAKE POSITIONS THAT RUN UP PRICES. THIS IS OUR ACHILLES HEEL. Some environmentalists actually espouse high priced energy (tacitly mostly nowadays), in the belief it forces conservation to occur, which it undoubtedly does. This is a trade-off I resist, because I believe it exalts the mud to the fish, that is, people and their welfare are more important than subspecies, and, I am not pessimistic about having enough resources (and learning how to use them) in the future.

CONCLUSION

DON'T SET PRICES WITHOUT SETTING QUANTITIES

EFFICIENCY MEASURES MAY BE YOUR CHEAPEST BET INITIALLY

DIVERSITY IS FINE, BUT WE MUST ADDRESS IT ON A REGIONAL BASIS

Exhibit 12

INCREMENTAL ECONOMIC POTENTIAL FOR COGENERATION (in MW)
PGandE SERVICE AREA[1]

Sector	Year 1989	Year 1999	Year 2007
Industrial Sector			
Petroleum Refining	1,228	1,248	1,266
Oil and Gas Extraction	73	72	58
Fruits and Vegetables	0	0	0
Sugar	21	23	25
Wine	4	3	3
Other Food Processing	30	35	39
Sawmills and Other Lumber	0	0	0
Paper and Paperboard	7	8	9
Corrugated Boxes	0	0	0
Other Paper Products	0	0	0
Inorganic Chemicals	38	80	91
Other Chemicals	109	128	147
Rubber and Plastic	0	0	0
Gypsum	10	11	12
Computing and Radio & TV Equipment	2	2	2
Semiconductors and Other El. Equip.	6	7	9
Guided Missiles & Parts	0	0	0
Other Transportation Equipment	1	1	1
Total Industrial	**1,529**	**1,618**	**1,662**
Commercial Sector			
Colleges & Universities	36	0	0
Community Services	75	57	68
Hospitals	31	22	26
Hotels & Motels	39	0	0
Food Retail	0	0	0
Non-Food Retail	3	0	0
Offices	8	0	0
Restaurants	0	66	80
Refrigerated Warehouses	1	0	0
Total Commercial	**193**	**145**	**174**
Grand Total	**1722**	**1763**	**1836**

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[1] Incremental potential refers to potential over and above 1985 installed capacity.

Exhibit 13

INCREMENTAL ECONOMIC POTENTIAL FOR COGENERATION (in MW) SCE SERVICE AREA[1]

Sector	Year		
	1989	1999	2007
Industrial Sector			
Petroleum Refining	471	477	517
Oil and Gas Extraction	1	1	1
Fruits and Vegetables	0	0	0
Sugar	0	0	0
Wine	2	2	2
Other Food Processing	20	25	28
Sawmills and Other Lumber	0	0	0
Paper and Paperboard	5	6	6
Corrugated Boxes	0	0	0
Other Paper Products	1	1	0
Inorganic Chemicals	2	2	2
Other Chemicals	62	86	95
Rubber and Plastic	0	0	0
Gypsum	5	5	5
Computing and Radio & TV Equipment	1	0	0
Semiconductors and Other El. Equip.	3	0	0
Guided Missiles & Parts	0	0	0
Other Transportation Equipment	6	1	1
Total Industrial	579	606	658
Commercial Sector			
Colleges & Universities	43	0	0
Community Services	0	0	0
Hospitals	43	26	30
Hotels & Motels	37	20	23
Food Retail	0	0	0
Non-Food Retail	0	0	0
Offices	0	0	0
Restaurants	13	16	19
Refrigerated Warehouses	0	1	1
Total Commercial	136	63	73
Grand Total	715	669	731

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[1] Incremental potential refers to potential over and above 1985 installed capacity.

Exhibit 14

MAKING PARALLEL GENERATION HAPPEN

ONTARIO'S EXPERIENCE

(EDITED TRANSCRIPTION)

HEDLEY PALMER

Energy Services and Development Director
ONTARIO HYDRO

Last week my associates and I celebrated my 40th anniversary with Ontario Hydro. It was a time for a bit of reflection. It occurred to me that when I joined that organization, those many years ago, the challenge for the company was to bend the energy from the last remaining hydro systems in Ontario to electrical production. Now some forty years later the challenge of the company is to bend the skills of the private sector to the production of electricity. Not surprisingly, the two have the same objective: to ensure a continuing economic supply of reliable electricity for our customers.

How do we go about making non-utility generation happen? In fact, for several years we have stumbled along in what we hope is the right direction. Along the way we have found some right knobs to turn and in the process we've turned some wrong knobs. In defense of the latter I can only paraphrase Thomas Edison who also turned the wrong knobs saying, "Think of what we learned by finding out what will not work". So what you are going to hear from me is our beliefs that have resulted from turning some of the right ones and some of the wrong ones. We have come to some conclusions about that. I am going to talk to you along three subjects or three different paths: corporate commitment, corporate responsibility and corporate action.

1. Corporate Commitment. The utility must be seen as and must be willing to be an enthusiastic buyer of power from private generation. It is not enough for us to say we will take it; simply saying so is not enough. It implies that the price that the utility is going to pay has to be some reasonable reflection of its cost of getting power from alternative sources. It has to have some basis for reasonable connection costs for private generators, as well as reasonable connection times and reasonable operating requirements. These are the externalities of the issues.

   The internalities include the commitment which must be part of the corporate business planning cycle within the utility. Senior management must voice its commitment both in house and in public. It is particularly important they do so in house. The line management in the corporation must recognize that this is a real part of our business and must use the necessary approaches within the corporation to get its resources, policies and procedures in order. It is really important.

2. Corporate Responsibility. The smart utility, I think, would concentrate the responsibility for parallel generation in one group. To do otherwise is to invite chaos, both internally and externally. That group has got to have a fair amount of responsibility for the following: coordination, development and recommendations on all essential details of parallel generation, policy and program to provide a single point of contact for all parallel generators and other units of the utility on parallel generation matters. You have got to get one guy who is going to talk to the fellows who want to sell to you, that same guy has got

to talk to the idiots within the corporation who do not believe you can do it. He must have the responsibility to carry out the negotiations. He must be able to coordinate the responses of the utility on individual projects, rate contracts and connections. He must have the responsibility to interact with external agencies, trade organizations, government and everybody who is interested in parallel generation. So does such a person exists in Ontario Hydro? Yes, he does. I would like to introduce him to you. It is not me, it is Mr. Alan Barnstaple.

I just wanted to tell you that Al has all of these responsibilities and he handles them very well, but occasionally I get a call from some other senior executive in the corporation who has said, "Look, you have a bunch of guys there that have left my people bloody and broken and lying in the halls. What are you going to do about it?" I said to them, "From my experience, take them all out and buy them a beer. Keep smiling, you ain't seen nothing yet".

3. Corporate Action. My plan is to talk about the internalities. It is the ability to get going, to make sure it is understood by the parallel generators and to make timely and sound commitments for individual projects. Basically this comes back to giving that parallel generation group an effective set of tools to do their job.

What are those tools? A clear line of communication with the corporate decision-makers in the utility. That means that Alan Barnstaple gets to talk to the President whenever he wants. We must set some standard rates and contracts for smaller projects and with the authority to negotiate within that framework there should be individual terms in the standard contract. This is because parallel generators have various nuances they would like to have recognized in the contractual arrangement. We are willing to do that within broad limits. These must be approved, the procedures for establishing rates and contracts for larger projects.

The truth of the matter is that for projects larger than 5 MW in Ontario we are moving very quickly toward a bidding process. We are going to go out into the market, perhaps in the fall of this year, with invitations to entrepreneurs to bid to provide electricity for Ontario. I cannot tell you exactly what form it is going to take yet. Next week when we get back to Ontario we are going to have a sit down with the President about it; if he smiles benignly at us, we will know we are on the right course. If not, we are going to go back and try again.

I believe what several people are saying around here. What are we trying to do in this business? We are trying to buy a good, economic, reliable, environmentally free alternative to building major power plants. We want people who use electricity to continue to have the same good reliability and reasonable rates as the present system develops, and maybe even better. We are not trying to develop a parallel generation industry because it is an intrisically good thing. It is only a good thing as long as we make use of private sector skills and entrepreneurship to produce a lower cost of power than the bureaucratic utility.

One final point, operational procedures that outline the functional responsibilities of the internal groups all have to be spelled out. Everywhere throughout the utility changes have to be made. You also have to put out various kinds of informative literature that tells the prospective entrepreneur what the rules of the game are. We have three or four, short, handy brochures that tells him what kind of information he should have with him when he wants to come and see us at Ontario Hydro. Someone should be in authority to explore non-standard proposals. We are not hung-up on any particular kind of proposal. If a man comes in and he has a proposal, after we think it through, if it looks good, we do not care how he is going to make electricity, he can make it by waving his hands, providing he can do that reliably for the next 20 years -- we will contract him.

Now lets talk about the real world for a minute. Most potential independent power producers approach the utility with all the enthusiasm of going to the dentist. The utility has to do something to dispel that concern. It does not hurt for us to listen carefully, to give support to the idea, suggest improvements if some are obvious to us, if necessary go down to the bank with the promoter and lend our presence to the proposition. What is wrong with that? We have to keep remembering that if the project develops it is going to be a very long term relationship, 20 or maybe 30 years. We had better get along together because we are going to be facing one-another down the decades. So we better start out on the right foot. It is not just enough to sign him up to a contract and to get him on the line, you also have to be able to deal with him afterwards.

Let me tell you one of the things that we are doing right now. We may not do it forever, but we are doing it right now. We read the meters at the end of every month -- the last working day of the month. On the tenth day of the following month we send the parallel generators out their bucks. It is getting to be a tidy sum. About a million bucks a month. Now I am not sure when Alan Barnstaple does that, he certainly seems to break every bureaucratic rule in the book about paying accounts. For some reason or other I have to sign those things. About the third or fourth day of the month there is someone in front of me, pen in hand and a sheaf of stuff that I must sign. I have never been able to get out of it so far. Well, I was away a couple of days last week and then I was coming out here to take part in this Forum this week and undoubtedly, they were there. I expect by now it is the 10th and all the accounts have been paid. You know sometimes they get awful short of cash and they appreciate getting their money soon.

I have a word for all of you potential and actual cogenerators and parallel generators. It is a miracle that the large sophisticated power system runs at all. Yet it does and it serves us with marvellous reliability. How does it manage that? Well, it manages because it has a very complex set of rules that define and separate the tasks on all the work groups in the utility and each work group is specifically accountable for that segment of the business. The interfaces are beautifully worked out. Adding a new element like parallel generation to the system is liking throwing sand in its gears. It blurs the interfaces and then confuses the well-ordered tasks. All up and down the system there are new procedures, new policies, new levels of comfort must be developed to make it work. That takes time. No one forgives the system operators for mistakes, they know that from the horrible lessons learned in the past and they are not so willing to accept the new rules. Be patient. Once everything is thought through and has gone around a few times, a comfort zone develops, everybody comes on side and we make a beautiful partnership together.

LUNCHEON ADDRESS

(EDITED TRANSCRIPTION)

THE HONOURABLE JACK DAVIS

Minister of Energy, Mines and Petroleum Resources

One of the great advantages of British Columbia is its diversity, its different climates and its different resources. And if we have one thing, it is a surplus of energy. Indeed we have got our surplus of energy already harnessed. I was asked when I was again appointed Minister what was the main challenge on the energy side? I said, selling the surpluses we have.

Larry Bell has talked about demand side management and parallel generation, I think this surplus we have, which we will eventually sell all right, plus demand management, plus cooperation with the neighbouring utilities, plus cogeneration gives us all the resources we will need for at least another decade. We have an opportunity to sell some of the surplus in adjoining areas of the United States and that is a challenge. Larry Bell comes to his office as Chairman and Chief Executive Officer facing those challenges. He comes with considerable ability. His background, as much as anything else, is economic. He has different challenges than his predecessors. Privatization for one. I noticed that the headline in the Vancouver Province this morning was "Energy Goes Private", well that is part of the story.

B. C. Hydro is a Crown entity of which we are all proud and it has a very important future and will continue to grow. There will be private power development and it will relate to B. C. Hydro. The big job that B. C. Hydro has in the future, I am talking about B. C. Hydro as a power utility, is to own, to operate the power grid. It is, and will continue to be, the big power utility in the province. Now it may not build and operate all of the additional generation in the future, but it has this power grid to offer and in British Columbia it also does the retailing and distribution. One of the reasons why, in addition to the grid operations, it must continue in the retailing or distribution end of things is that, if it is to do a real job in demand side management it must do the retailing of electric power.

B. C. Hydro is province-wide, certainly its grid is province-wide. It distributes in most municipalities in the province and will continue to do so. The private sector role will largely be in respect to new generation. There will certainly be new generation opportunities in existing industry where parallel generation or cogeneration, utilization of woodwastes and other byproducts to produce steam and energy make sense and can make sense if B. C. Hydro offers the right price for the resulting power. In our case, I think B. C. Hydro will also help, in some instances, to finance the necessary hardware, the necessary plant and equipment. So there is a big challenge and new role for B. C. Hydro.

There has been talk about cogeneration. We have had some cogeneration, but we will have more of it in the years to come. Demand side management really is not new in British Columbia, but certainly Hydro has never publicized its interest, it has never mobilized its people to the extent that it has recently, in order to encourage conservation, the more efficient utilization of our existing energy resources. This is substantially a new industry as far as B. C. Hydro's initiative is concerned. I say it is not altogether new, across Canada. You are all aware that over the last 15 years there was a considerable federal and provincial effort to better insulate homes and so on. I think, in comparison to a number of states in the U.S., we are probably more efficient users of our home space heating energy than many of those jurisdictions. So, in general, we have been attempting conservation, but B. C. Hydro from now on will be encouraging cogeneration in a much more determined and organized way.

I think B. C. Hydro's main role as an agent of government, or an agent of the people if I can put it more generally, is, of course, to help promote economic growth. At the same time B. C. Hydro should have an eye on the quality of life, which not only means conservation, but in its development, being very sensitive to the impact of new generation, its new transmission lines, its distribution activities. It should be sensitive to the impact on the local environment. It is a big challenge to both encourage better economic development and at the same time look after the environment. I think Larry is up to that. I know his staff is up to it.

B. C. Hydro, in its public image and the message to the public, must emphasize its concern about the environment. I am talking about Larry as if he is all powerful. I recall going to the United Nations Conference on the Environment, the first one which was held in Stockholm in the early 1970s. It was the first U.N. conference attended by mainland China and it was interesting. A very large Chinese delegation came. The head of the delegation was the Minister of Power. He was also the Minister for Environment. From the Chinese at that time the message to the rest of the world was let us get on with our economic development like advanced economies did in the last century and the first half of this century -- when we have reached your standard of living we will concern ourselves with the environment. That was one of the reasons they sent the Minister of Power to head up the environmental delegation, but still I think Larry will be much more sensitive to the environment than that delegation appeared to be at the time. A Minister of Power concerned with the environment is, in fact, unique.

Now the private sector role. In most of North America as the majority of you know well, power is generated, transported, and sold by private utilities, not by government utilities. In Canada the norm for power development was through government corporations. This trend began many, many years ago beginning with Ontario Hydro under a then Conservative administration; they were trying to keep Niagara Falls from the Americans and that is why Ontario Hydro moved that way. Before that, certainly in this province, the developments, especially those related to metallurgy, pulp and paper, mineral development, including the Trail smelter complex and the Kitimat aluminum development, you had private companies and they developed their own power sites for the use of their own particular industry. And there is still a rationale for that kind of thing, especially in the interior and the north. If there is a unique site, a hydro site, with a large body of minerals nearby, it makes some sense to process those minerals locally, right in the area, with this uniquely cheap source of power.

There may also be instances where developments of that kind have surplus energy. The scale of the power development could be optimized using an installation which is larger than the immediate or short term metallurgical requirements and some of the surplus could be sold. We have a situation such as that now with Alcan selling power to B. C. Hydro and Hydro marketing it elsewhere. Alcan intends, in the longer run, to use that power for further private sector manufacturing and resource processing.

Another thing that is happening is that this private energy is able and will increasingly be able, in this province, to move over B. C. Hydro's power lines, not to existing loads served by Hydro, but to new loads, new industry, new industrial opportunity. In the trade this is sometimes called wheeling energy along transmission lines, that is moving someone else's energy along your lines, moving private sector energy along B. C. Hydro's transmission grid or perhaps over part of it. I think we are really leading the nation. We are probably one of the first if not the first on this continent to open up the electric utility grid to the wheeling opportunity so that developers of power, either private or public, can sell some of their firm energy in a distant location or at a location in B. C. Hydro's system.

B. C. Hydro, of course, has to be kept whole financially. Indeed, Hydro's relations with other utilities and certainly with the private sector, should be arms length negotiations, not regulated, essentially sound business deals, so that the private sector operations are in no way subsidized. Conversely, B. C. Hydro should not stand in the way of what otherwise would be a logical development. So the wheeling opportunity is there increasingly in this province. The parameters basically in respect to these exchanges between private sector companies and B. C. Hydro, and other utilities on its borders and B. C. Hydro, will be determined by arms length or will result in arms length sales or business considerations. There are some people who are concerned about the evolution of free trade with the United States. We will treat the Americans the same way as we will treat the neighbouring utilities in Alberta or private sector companies or private sector buyers. It will be an arms length sale. It is not a regulated sale. It is not a sale at our rates within B. C. Hydro. It is not a sale at B. C. Hydro's cost. It is a sale at whatever the market will bear. And so, B. C. Hydro will be dealing with neighbouring utilities, be they public or private, and dealing with individual companies, generally private. They will always be dealing in a business-like manner, not in a regulated manner.

B. C. Hydro will have its core market, the little people, the residential consumers, the small and medium-size commercial establishments and small business. They are the people who have the right to receive B. C. Hydro's power at average cost. Anyone outside what I will loosely call that core market, will have to buy their energy on a market-determined basis, not yet at a regulated or cost-only rate. I want to emphasize again the international trade aspects of this. We will sell across the border, but we will always sell at arms length. We will not sell at our own internal average cost rates. We will sell at whatever the market will bear. I am sure that utilities in the United States and Alberta would not expect us to do otherwise. I am certain that their political masters would not allow them to sell at average cost to us, if our need was greater and we could afford to pay more. So the free trade agreement, essentially, makes no difference. It makes very little difference to the game that utilities have traditionally played. They have been regulated, they supply their own customers at average cost. They charge whatever the market will bear to their neighbours. We do this now to TransAlta I believe. B. C. Hydro is selling some of the surplus energy from Alberta in the United States and is getting what the market will bear for carrying that power through B. C. Hydro's system. And there will be more of this. There are great opportunities through greater cooperation with our neighbours, our neighbouring utilities.

There will be gains by encouraging the private sector to develop certain unique sites, by allowing the private sector to wheel energy through Hydro's system while compensating Hydro fully for that service and by trade with the United States. Now, we have never really exported power in a big way to the USA. We have received several hundred million dollars in certain years for selling what happened to be a surplus. We overbuilt and happened to have a surplus. We sold it short-term, but we have never in this province built plants deliberately to serve the U.S. market or Alberta or any neighbouring jurisdiction. One of the reasons we did not do it in the past was that our costs in British Columbia were higher than rates in the Pacific Northwest. In other words, we were high cost, they were low cost; it is very difficult to sell into a lower cost area. That is the reason, historically, that export trade has not been more than just incidental exchanges. But the wheel has been turning, rates have been rising in Washington and Oregon. Today they are roughly comparable with those in British Columbia and in the future, with our rates relatively stable and theirs continuing to rise, we will have an export opportunity.

We are moving into a new era where there is export opportunity, not just to exchange energy on an incidental basis when we happen to have a surplus -- too much rainful or overbuilding or whatever, but building deliberately; building deliberately to serve a market in the U.S. Now the business-like approach to that opportunity is to assess the market, to know what the market is on the U.S. side and, in fact, to contract for a certain delivery to the United States before committing to build here. That must always be the secret. The market must be determined, the market must be quantified in contract before there is any construction here. Now if it is private sector construction, it is speculative in any case. Nevertheless it is our determination that through a subsidiary of B. C. Hydro, I will call it the British Columbia Power Export Corporation, a single window approach, a single sales desk, will be opened to the U.S. And that entity's job will be to keep an eye on the short-run exchanges, to be knowledgeable about sales opportunities on the other side of the line and to assess possibilities of sales. Eventually, the Export Corporation will quantify those sales and even develop contracts for the delivery of firm energy and then turn around, and I think Mr. Bell described the opportunities in quantitative terms yesterday, and call for expressions of interest from the private and public sector in British Columbia.

Having determined the market, having determined the income flow that is likely from a firm sale -- firm sales mean 10, 20, 30 years -- then look for sources here and hopefully make a profit by buying from the sources in British Columbia, always knowing throughout what the income flow is likely to be. These sales must be long term if they are going to provide sufficient income and predictability to finance and plan. One possibility is a coal-fired plant in the East Kootenays, another could be a Hydro site, Murphy Creek, for example. Those can be determined and when we know for certain that there is an export market on the U.S. side, when we know what the quantity of the requirement is, its duration, and, above all, the price and escalation parameters, when we know what the income flow is likely to be, then this export corporation can turn around and invite tenders, call for expressions of interest.

If there is an export opportunity and you have the respective income flows, you indicate which proposal you think makes sense. An East Kootenay power plant with costs which are in line with or less than the opportunities in the U.S. right now would be an example. There are probably several Hydro sites in the province that might similarly deliver energy at a lesser cost at the boundary than would be provided by opportunities on the U.S. side.

Of course, from a provincial point of view, we want to make sure that the difference in price is always picked up, either in the private sector through taxes or by the export corporation which makes a profit as a result of its enterprise. But those are possibilities, certainly we will see the private sector developing firm Hydro sites, perhaps thermal sites, for use in particular industries such as resource processing industries in the interior and the north. The first off the mark is, of course, the Aluminum Company of Canada, and it has an opportunity with the settlement on the Nechako River flows. I am encouraged by the possibility that Westcoast Energy, which used to be Westcoast Transmission, or others may, as a result of invitations to tender, build a medium-sized gas-fired power plant in Fort Nelson. A new facility could look after any foreseeable pulp mill development up there and sell surplus into Northern Alberta. Otherwise, TransAlta will have to build an expensive plant in Northern Alberta. These are opportunities and it is market-related development, which is a new approach.

B. C. Hydro, for two decades at least, was the be all and end all of power development in the province. It was the only outfit that was enabled, under law, to develop new power sites. It did everything and its costs automatically flowed into the rates. It tended to operate province-wide. The concept was a B.C.-wide power grid which is all right for small consumers. However, if you lived up north and you had a convenient power site nearby which you knew was low cost, you were not keen to buy from Hydro at the average B. C. rate when you knew that power developed locally for local use could be lower cost.

Power could act as a magnet for industry. So we need a blend of big Hydro running the big grid, wheeling other people's power, working cooperatively with the private sector, working with neighbouring utilities, looking intelligently at the export market or at relationships with neighbouring utilities in the United States, and, of course, always being concerned about the efficient use of energy, certainly demand side management within the province.

These are all, in varying degrees, new and fresh initiatives. It is a new chapter. It is a new era as far as Hydro is concerned, but I think Canada-wide it is trailblazing. Power utilities in this country have never carried other people's electricity the way gas pipelines now cross the continent carrying other people's gas. Indeed, in the gas business, when the gas transmission companies are told not to own the gas in the line they, in future, will merely own the line and operate as a common carrier. The gas in the lines will be owned by the producers or the consumers or a combination of the two. To some extent we are moving in that direction in the power business. The end user, the producer, all have voices in the development of a very impressive system which we already have and which will grow and be better as the years go by. Certainly, it will be more efficient and I think it will fit better with our environment as well as our needs for economic growth.

PANEL DISCUSSION: DEMAND SIDE MANAGEMENT

(EDITED TRANSCRIPTION)

PANELISTS:	HEDLEY PALMER, Ontario Hydro
	ZAK EL-RAMLY, B. C. Hydro
	RALPH CAVANAGH, Natural Resources Defense Council
	JOHN SHEEHAN, B. C. Hydro

DEMAND SIDE MANAGEMENT PANEL DISCUSSION

10 JUNE 1988

Panelists: Hedley Palmer - Chairman
Ralph Cavanagh, Zak El-Ramly, John Sheehan

Zak El-Ramly

I will raise a few issues that you can center your questions around. One of the issues to discuss in the future is how to maximize the benefits of demand side management, how to make demand side management reach all kinds of customer classes -- low income groups and senior citizens for example. Another question is the type of incentives required for the different programs. What do you think will appeal to the customer or make the consumer move? What will make the service industry get into a certain business? We need feedback on that. The programs we have presented are just the first set that we have developed. If we can come up with new ideas we would certainly be very interested.

We are also interested in maximizing the benefits of the budget that we are going to spend on DSM. We would like to get the maximum number of kilowatt hours from the money we are going to spend. After all, it is not our money, it is our customers' money -- everybody's money. So we are looking for leverage to maximize the benefits. If you can come up with ideas please share them with us.

Another issue in demand side management is that of free riders. In some of the programs we are going to be giving incentives to somebody who would have done this anyhow, thus you are carrying free riders. How do you structure programs to minimize the number of free riders? That is another issue. The last issue that the chairman has raised is how to get groups interested in coming up with proposals for providing us with kilowatt hours saved.

Ralph Cavanagh

In addition to Zak's issues which are very much worth discussing I want to put three proposals on the table for you. They all reflect the fundamental marketing problem of electric utilities which is that no one values kilowatts or kilowatt hours for themselves. There is no demand for the product independent of the services it provides.

Amory Lovins showed many of you yesterday how you could provide all of the energy services now being delivered by our current economy at about 30% of the present electricity consumption. The cost of the technological changes is far below the kilowatt cost of new stations, and in many cases, below the operating cost of existing stations. He also told you about rapid and continuing technological progress in efficiency throughout the Western and Pacific economies. That creates two major risks.

The first is the risk that the free market will work like it should. In the long term, demand for kilowatt hours and kilowatts, as opposed to the energy services they provide, will decline or at least stabilize and that will happen after B. C. Hydro has made long term commitments in anticipation of 75% growth in kilowatt hour consumption over the next 20 years.

The second risk, which I think is more likely, is that the market will not work as intended, in which case efficiency opportunities will remain unrealized. The B. C. rate-payers will invest billions of dollars in new supply that although it is fully utilized, could have been avoided. That is the reverse of sound economic development. Hence my three proposals as antidotes to these risks.

The first is a provincial commitment to identify and exploit all demand side management opportunities that are less costly than new supply. Start now with a thorough inventory of untapped options which will show us what we can get beyond the 3000 GW.h already identified. The 3000 GW.h is only about 4% of anticipated provincial consumption in 20 years up. I indicated already why I felt we can do much better.

The second proposal is a commitment by B. C. Hydro to let conservation compete on equal terms with other supply options for Hydro investment dollars. Concrete example: B. C. Hydro has just announced its intention to hold an auction for 200 MW of new capacity. Why is conservation not competing on equal terms for those dollars? Why hold an auction limited only to generating options?

Third and final proposal, let us integrate demand side management fully into B. C. Hydro's export policies. British Columbia will be entitled, within the decade, to the return of the Columbia River downstream benefits which were provided under treaty to the Pacific Northwest. How about offering to extend those benefits in the Northwest United States if the Bonneville Power Administration will agree to finance equivalent conservation in British Columbia? Trade the benefits for an equivalent amount of efficiency investment by Bonneville in this province. That is a more promising economic development strategy than the one I described earlier and I would be glad to discuss any and all of these points.

John Sheehan

I think by now you should be convinced that Hydro is serious about demand side management. We may not be doing all of the right things yet, but we are only in the beginning of this significant change in our direction and in our method for satisfying the increase in demands which are on us.

There are increases in demands because, in spite of what we might see as improvements and efficiencies, the demands on us for the domestic use of electricity increased 5% over the previous year. That was far more excessive than what we had forecast and, in fact, the demands for the last three years have been in excess of what we had forecast. You saw the kind of fan-tails of what forecasts were like in the 1960s where we were constantly underforecasting what the demands would be. In the 1970s we were constantly overforecasting. But in the last few years we have been again underforecasting and we have been encouraging conservation for quite some years. This has not been with the same intensity that we are moving into demand side management, but Hydro had up to a 60-man conservation group established since 1976/77 under Tim Newton. Hydro has been amongst the foremost in Canada in recognizing that conservation is needed in this province to avoid significant additional borrowings by the corporation and significant additional commitments to new plants.

It is only in the last four years that Hydro has been decreasing the enormous debt that had been increasing every year since it came into being. With the assistance of demand side management I believe we can continue to reduce that debt, continue to decrease that mortgage which each of us would ultimately have to pay in one form or another, and continue to enjoy a real rate decrease in the use of electricity. Demand side management means that we will be more efficient in the supply of that electricity. We have an obligation to make sure that we are not only efficient in the use of electricity, but that we are economical in the supply of electricity to our customers.

I am convinced that we have been sensible in how much we do pay for demand side management. We have all agreed that the inventory of savings in electricity that we see is only scratching the surface. At the same time, it is an ambitious program for us for the next year or two. Recognizing, as the Minister mentioned, that we do not need the savings in energy necessarily at this point in time because our embarrassment was surplus, surplus of both the secondary energy and the primary energy that we have had for some years. It is hard to rev-up people with enthusiasm when their problem is trying to get rid of the surplus for the time being. But if you do not get the car going now it will not have proper momentum when we need it. We will need it very shortly at the rate that demand is growing. I think it will be in excess of the curves that we showed you. If the demand on us and if the economy keeps growing as it has been for the last couple of years, we will need more intensive demand side management sooner and more intensive results from it far sooner than anything we have been showing you.

As Zak and others have said, we welcome all the ideas. We will not say that we can handle all of them at this time. We have got to learn to walk a little bit first. And yes, we have got lots of pilots and some of them have been very expensive, but that is what we have to do in order to get our people educated. It is a massive change in the culture at Hydro, getting our people to recognize the benefits of demand side management as opposed to supplying more of a product to the customer. We will try to answer any questions. Hopefully we can construct better information for all of us at the end of this session.

Hedley Palmer

I am prompted by Ralph's remark that demand side management should be put in competition with other means of balancing supply with demand. If you look solely at demand side management where the utility pays some money to make it happen, those customers who adopt a particular measure will use less energy and their bills will go down. For those customers who cannot adopt the measure, their bills will go up. They will continue to use the same amount of energy as before and because this represents a cost on a declining rate base, their bills will go up. How far should one press that issue? In Ontario Hydro we are thinking seriously that what we want to achieve is a situation where, on average the cost of electricity may rise above that of producing alternative supply but customers' bills on average will be less than before because they will have achieved a lower, more efficient energy use.

But that implies that there are enough programs out there and enough measures so that almost everyone can take advantage of one or the other of them. In that process there are obviously going to be winners and losers. It provides seed for rebellion among the customers. We are certainly interested in your views. How much weight should you give to the winners? The losers' question is distinct from a question of making society more energy efficienct and having lower bills on average, even though the cost of those who do not use any measures would be substantially higher than if we had built more generation.

Unidentified Speaker

While I have been listening to all of you I have been waiting for somebody to say one thing. With demand side management will retail prices go down, will they stay flat or will they go up? And to me, that is the real test as compared to the supply options.

Ralph Cavanagh

I suggest that the one thing that matters to you more than the price you pay for a kilowatt hour is the bill you pay for the kilowatt hours you use. Is that a fair statement? Surely the bill that represents the amount out of money in your pocket is more important to you than the price you pay for a unit of electricity that goes into computing the bill.

Unidentified Speaker

Obviously the total bill is more important. However, I do not think it addresses the question when you evaluate demand side versus supply side options. Rates should go down more under demand side if it is more efficient than supply side when you look at retail rates.

Ralph Cavanagh

That is demonstrably wrong. I want to challenge your premise.

Unidentified Speaker

I will turn it around. If the demand side programs are good I think it is upon the utility to show the customers that the rates would be lower than otherwise if they chose supply side options or other options.

Ralph Cavanagh

But would it not be an even more potent and powerful showing to force the utility to demonstrate that bills would be lower under demand side management. Under demand side management you are selling fewer kW.h than you would be selling under an all out supply side effort. That means that there are fewer units over which you can spread the fixed cost of the system, so you may well have higher rates per kW.h. None of you care about kW.h, you care about the service. You care about the bill.

Unidentified Speaker

We could go on for a long time. There is a whole bunch of costs that you have to add up. It is not a simple question. The final test is the retail price.

Zak El-Ramly

The strict answer to your question is yes, the costs per kW.h in our case should go down, go down compared to the rate that would have existed in the actual demand side management. So let us say B. C. Hydro needs 5% increase in two years because of inflation and other costs, if you are into demand side management perhaps the rate increase would be 4% instead of 5%. The net effect with demand side management under our own operating hydro system would be less than demand side option. When we have a demand side management program we run this program and we compare it to the next best option. If the next option is Site C any demand side management program that we implement must produce kilowatt hours at a rate lower than the next best option.

There is a difference between the Ontario Hydro system, and the B. C. Hydro system. With Ontario Hydro system because it is nuclear or thermal, any time you do not generate a kilowatt hour you lose it. That is why you have to spread the net revenue requirement over a fewer number of kW.h. With B. C. Hydro you have all the energy stored behind the dam and unless we run such a good demand side management program that we start spilling water, the number of kW.h sold remain the same.

There is a big difference here between the Bonneville Power system and the B. C. Hydro system.

Unidentified Speaker

Do you present your plans in this fashion showing the rate impact to the B. C. Utilities Commission - showing here is the demand side option and here is the forecast of rates versus the supply side.

Zak El-Ramly

Exactly. Hydro has something called the Resource Planning Model. In the resource plan you have all the options and all the costs of these options. So you say Option 1 would be at 1000 kW.h at a certain price and they enter in competition with each other. The resource planning model will rank the resource plan according to that function. Yes, conservation or demand side management must compete with other options including purchase from Alcan, purchase from Alberta and Hat Creek. Those options are ranked in order of merit. By definition any demand side management program must reduce the average cost per kW.h, at least over the planning period of 20 to 30 years.

John Sheehan

We have only recently inserted demand side management into this plan. While we will be selling less each year from here on, what we are really trying to avoid is a big jump in your rates when Site C comes in. We will be incurring about $10 million this year on demand side management which will not produce an offsetting reduction in rates. We have not finalized how we will account for that.

Logic says you should capitalize that the same as if you had started building Site C now. You would capitalize the $10 million you spent this year and the $20 million next year, and you would start to use that capitalized amount in 1996 when you brought in Site C. And that is what we should be doing with demand side management. Unfortunately, accounting convention would not allow us to do that. So yes, there will be higher costs in Hydro in the early years in order to have much lower costs in the later years. But what we are trying to avoid is bringing in, we will say Site C in 1996, bringing in 4500 GW.h at an average rate of say 45 mills, but instead have saved energy at less than 45 mills.

We are not going nearly as far as Ralph has been describing. What Ralph was describing was where you go further and your average rate would increase, but in the home, each one of you would be using less kilowatt hours. We are using, as an evaluation factor, the Site C costs. We are making Site C the marginal cost or the alternative.

Ralph Cavanagh

I agree that each saved kilowatt hour must be cheaper than the generated kilowatt hours that they replace. The impact on rates I am suggesting is not as important as the impact on bills. I doubt that anyone would disagree with that. Everyone would simply want assurance that their bill was going to be among those that would go down.

I hope none of you imagine that with power plant construction there are not winners and losers. This effort to avoid losers is sometimes called a 'no losers test'. One of my friends has rechristened it the 'hardly any winners test', which is what happens in his view and in mine.

If your goal is to make sure there will never be a situation where someone gets more conservation than someone else, you must make sure that programs are widely available and that participation opportunities are equitably shared throughout the population. If people choose not to take advantage of those opportunities then the fact that their bills and rates may go up is not the determinative factor in deciding on a provincial energy policy.

Mark Jaccard, Professor, Simon Fraser University

Zak El-Ramly, it is very encouraging to see you outline the various policies and programs that you are hoping to implement. B. C. Hydro is not trying to reinvent the wheel, but learn from the experiences of other jurisdictions and utilities. The comments of Sue Hickey were very interesting for us in British Columbia. Yet I must admit I was a bit disappointed because you seem to be suggesting various programs, in a first shot kind of way, saying, we will try this and if that does not work then we will offer money incentive.

I can see that a lot of programs that you are going to initiate you will end up in that kind of situation. But I would also like to have heard you say you are looking closely at results in Seattle. In other words I would like to hear there is a real awareness of what has been going on in other areas.

We have heard a lot said that British Columbia is the first. But I think we are not the first. Maybe in Canada, but we have a lot to learn from others. I think that when you are developing these programs we really pay a lot of attention to what people have already been doing. We have the Northwest Power Planning Council and what has been going on with Bonneville which some people say is the exemplary model for North America -- they are right next door to us. So, as much as possible, I think we should just be emphasizing a look at specific programs that they have already developed and see how they are applicable.

Zak El-Ramly

I appreciate your comment. The words and the time seem to have failed me yesterday. This is almost exactly what we intend to do. I was trying to tell the audience that if we make a change it is because we feel that the change is necessary rather than us simply changing our mind. We are trying to promote internally and externally that, in some cases, this is our first effort, even though some of the programs have been initiated in the United States. We have a different economic environment and we have a different social structure. Every program that we launch is almost like the first time.

I was trying to say that we are not going to blindly implement every program. If a program needs realignment we will do that. But we invite you, if you have any ideas, to talk to us if you think that some of the programs for one reason or another have a flaw in the logic. It becomes your responsibility as well as ours.

Mark Jaccard, Professor, Simon Fraser University

I would not be surprised if you were to bounce some of these programs off someone from Bonneville they might say to you that one will not work and why and that one will.

It would prevent us from having the high costs of making mistakes. We can minimize them, but of course we are going to have mistakes.

Zak El-Ramly

We visit all of these utilities, we talk to them and we exchange ideas all the time. We do share our ideas with a lot of other people.

Robin Siddall, West Kootenay Power

Could Ralph speak about the Northwest experience on model conservation standards and could the panel speak on the need to legislate or not legislate these standards so as to avoid lost opportunities.

Ralph Cavanagh

Model conservation standards is the term for the Northwest's efficiency standards for new residential and commercial construction. Those standards were established by the Northwest Power Planning Council in an effort to minimize the energy costs in a cost effective way for new structures. The special concern was that new houses and commercial buildings tend to stay around for decades if not centuries, and if you do not get the design right up front, in many cases you either cannot get it right at all or it will cost you a great deal to fix it in the future.

The Northwest's original approach was to try to get all of these standards adopted by the four state legislatures as mandatory codes governing all new construction. That effort ran into determined opposition from the building community which said these requirements would increase the initial costs of constructing structures. They agreed utility bills will be lower, but meanwhile people will be priced out of loan markets by the increased first cost.

What happened is an instructive lesson that will have some application in a different system to the North. You should not think of regulation and incentive approaches as mutually exclusive. The lesson from the Northwest is they can work very effectively together and that much of the opposition to regulatory approaches is going to come from local governments who do not know how they can afford to pay for enforcement, and from builders who are concerned about the increased first cost.

What if the utility system offers to pay some of those enforcement costs for the local government? What if they offer to make up that first cost increase, or at least a substantial part of it, for the builders? At that point the builders are suddenly in a position of marketing a better home for the same price, and the local enforcement authorities are in a position of being able to cover the increased costs of training builders and training inspectors to make sure that the code is complied with. That is basically the direction in which the Northwest is going. The program I just described is called the 'Early Adopter Program' by Bonneville. It pays incentives to both builders and enforcement authorities in jurisdictions that adopt the model conservation standards as code.

I think this general approach is going to make the model conservation standards a region-wide norm in the Northwest. It is going to change builder behaviour. The results in terms of forecasts and in terms of need for power are quite dramatic. The model conservation standards house, for example, in terms of its electricity consumption, is about 60% lower than typical construction practice before the standards went into effect.

The question then for B. C. is has Hydro or any of you in the private sector calculated the true cost-minimizing new B. C. house would use in terms of energy? Trade off the cost of the efficiency measures versus the cost of new power supply, translate that into efficiency specifications for new housing and then look at how B. C. Hydro might persuade the building community to move in that direction. Again, do not think about regulation incentives as if they were mutually exclusive. They can work together and that is often the best way of making this happen.

John Sheehan

Our jobs would be very easy if we could get all of our desires legislated. On the other hand, if we did so we would be seen as the cold utility which gets its way regardless of what the consumer wants. I think our job is to go out there and get the consumer to want these things first.

Legislatures will not legislate things unless they are favorable with the voters, and you cannot expect them to do our job for us unless we go out and get the voters to favor these new codes. The obligation is on us to have that customer relationship. We have to do the education and provide the incentives so that the legislators will have demands from their constituents, not from the utility. It is very difficult to get the legislators to move if it is only the utilities crying for the change, no matter how logical it might seem from an engineer with their technical viewpoint. I am convinced that we cannot approach the legislatures and municipalities and others for support. We have to do our work first and convince the community that these are good for them.

Victor de Buen, B. C. Hydro

I believe the question of what the right price is or should be for conservation does not end with whether the total bill for customers is higher or lower. I believe we have to go beyond that. We should deal with the question of the mission for the utility and its main objectives. Here are two examples. First let us look at a company which, for the sake of argument, is privately owned and attempting to maximize its returns. This company would pay for conservation, only the difference between its marginal cost and the trailing step of the rate that applies to the conservation program. Why? Because this company's aim is to reduce demand, but only to the point where it pays what it is losing because its rates are below its marginal costs. If Hydro was supposed to run its electric power business strictly like a business that might be a viable proposition. In fact, that is how much B. C. Hydro would have to give to its customers.

Let us now look at the other approach. Let us say that Hydro, above all, is supposed to support economic development, that it has a number of objectives related to the community well-being. In that case you might extend the boundaries of the optimization to include not only how much the utility pays in terms of program costs and incentives and how much it saves in new generation, but you may also include how much the customer may be saving by using cheaper appliances.

Do you not believe that the answer does not lie with the size of the bill or the company's revenue requirements, but with the utility's objectives? In other words there is not a single answer, there are many answers and to find the right one we have to decide which more closely reflects the individual company's mission and objectives.

Ralph Cavanagh

There are always many answers, but often many of them are wrong. I believe that the right answer for Hydro or for any utility is that the mission of the utility is to provide whatever level of energy services that society wants at the lowest possible cost to the society. I would hope we could all agree on that.

I am arguing for things like buying all of the conservation that is cheaper per kilowatt hour than new supply because that is precisely the end to which such policies are devoted. I am concerned about any restriction on the utility's ability to invest in cost-effective conservation. When I say cost-effective conservation, again I mean conservation that is cheaper than new supply. If you begin imposing restrictions on how much the utility can pay, you run the risk the utility will end up foregoing conservation that is cheaper than the new supply the utility will end up building.

Many of you may be wondering why are we talking about utilities investing in conservation at all. Paul Joskow is a professor from MIT with whom I have had several debates. To oversimplify, his reaction is why are we worrying about all this utility investment in conservation. Let us just get the prices right. Get the prices right and people will make the efficient decisions.

A fundamental problem is that investment in conservation by industrial, commercial, residential customers are made in a very demanding way. I do not want to criticize that, I just want to report it, baldly and empirically. You customers insist on a very rapid payback of your investment, generally two years or less.

The investments on the supply side are made by entities that are very much more forgiving in their investment. John Sheehan at B. C. Hydro is one of the most forgiving investors in all of western capitalism. He buys things that have a repayment schedule of 75 years. If you have all of the supply side decisions being made by people like John and all the demand side decisions being made by people like you and me, you are going to waste a lot of money on the supply side that you could have displaced more cheaply on the demand side.

The challenge is to get John's investment perspective over to the demand side. That is what is happening when we are talking about utilities investing in conservation, and that is why it is not enough to just get the prices right. Simply raising B. C. Hydro's rates would have all of you applying those same fast payback requirements at a somewhat higher rate level, and you would still be missing a great deal of the cost-effective conservation that Amory Lovins was pointing out to you.

Victor de Buen, B. C. Hydro

What you are suggesting then is that one of the missions for the utility would be to have this sort of levelizing effect. The customer has a short payback, the utility has a long one. You are saying it would be part of the utility's objective, then, to act in this sort of levelizing fashion: In other words, there is not only a social objective which everybody acknowledges and accepts, but something which goes beyond that. It gets one step short of legislation. The question that I am asking, are you, in essence, accepting the notion that the evaluation criteria is subject to qualification for what a utility is? Having accepted that, you are saying yes, the utility should get this area. Is it up to the utility or is it up to government to do that?

Zak El-Ramly

I agree with Ralph almost 100%, except what is the responsibility to the customer and the utility? I will give you a walk-through on how we evaluate a program. Let us say you want to look at the fluorescent lighting program. We know that a fluorescent tube will cost $10 more than a standard tube. It does not matter at this point who is paying for the light tube.

We look at it from a cost-benefit analysis framework. (You look at the saving in energy and you look at the light of the fluorescent tube). Is that a reasonable energy conservation or demand side management project, or not? If the answer is yes, it is easy. If the answer is no we ask ourselves a second question. Assume that we heavily promoted this program. Is the marginal cost likely to go down? If the answer is yes, then it is easy again. If the answer is no, then how do you force it to go down? With a very high promotion and with something that is not economically viable in the beginning still may end up being economically viable a year or two down the road.

And that is why, for example, we give light tubes free in the Queen Charlotte Island area. You want to reduce the price premium. Then we wear our Hydro hats and say how do we get the customer to wait for most of that. And if it is only an educational and promotional program then the program is promoted through education and promotion. If it is impossible for customers to accept the payback criteria that we would like, (in our case the payback criteria is a true life cycle for the house to be 25 years) we ask how much incentive should we give them to get them to invest?

I think Ralph and myself are approaching the problem from a completely different direction. He is saying if it makes economical sense go ahead and do it. I am saying no, if it makes economical sense let us try to get the customer to do it first and then keep pushing until you get it done. But I think we are agreeing on what should be done.

Ralph Cavanagh

I have no problem asking customers to share the costs. I have two concerns though. The more you are willing to pay the more you get. I hope that the B. C. Hydro approach is to set us up very demanding targets and say we are going to get 90% of this resource. If we can get some people to put up part of their own money up front first that is fine. Ultimately if that does not work we are committed to going all the way up to the cost-effectiveness limit.

Also, there is one problem associated with programs that are too dogmatic about making customers pay. Invariably when that approach has been tried, and here we have a huge base of experience to rely upon, you can be sure that any partial financing program will disproportionately exclude low income citizens. In the United States where the initial effort has been to get the customer to take as much of the burden upon themselves as possible in the form of partial loans and grants, you can get some people but you will never get low income families. You want a program whose social benefits are equitably shared, and this is the social mission most utilities regard themselves as having, in addition to the purely economic mission I refer to. You have got to be prepared, at least for low income customers, to pay the cost of this resource if you want to get it into those homes. That is an objective many of you would insist would be politically necessary, I think.

No one can disagree that the utility should minimize its cost of acquisition as long as the utility is committed to getting the full resource. My concern is that in many cases utilities will find a large technical resource of savings opportunities but will then conclude that because of limitations in their own marketing capacity they can only get about 10% of the potential. That is all they will count on in their resource plan. The conservation resource is compressed accordingly.

I suggest, based on evidence I already presented, that utilities should set the goal of getting virtually all of the technical potential they have identified by using all of the marketing tools at their disposal. As long as that is done I agree with Zak that in the early years, as long as you have accounted for your low income rate payers, it is perfectly reasonable to see if you can get some of the resource at lower cost by getting the customers to put up some of the money.

Guy Rose, Board of Directors, B. C. Hydro

It sounds like we are all born again demand siders in this room and it is a great wonderful feeling, but I have had four experiences recently with trying to take advantage of demand side management. First of all we built a house on our ranch last year. I was quite interested in the R2000 programs out of Ottawa. They send you books. So I went to my local building contractor who is a good friend of mine and I said I want one of these R2000 houses. Do you know you have got to go to Vancouver and take the course? There is a $500 grant, the whole deal. He said forget it, I know how to build a house. Just tell me what kind you want In the end I bought a pre-fab house and my friend does not talk to me much anymore. I wanted an R2000 and we built it, but I had to buy it from Langley. The people in our valley did not know anything about it.

About a month ago I got one of these new fluorescent lamps from Hydro and I thought I would get a bunch for the ranch. I went into the Lamp Post, which is a retail store in Kamloops, and asked for them. They said those things they cost too much. They can get them, but they told me to really think about it because I would never get my money back. I bought some ordinary light bulbs.

Then I had to get an irrigation pump. I ordered a 30-horse irrigation pump for a new field we are developing and I asked the guy from Penticton who sold us our irrigation equipment to make sure it has an energy efficient motor. He said these 600-volt pumps are so hard to get that it comes from Berkeley. He said we were lucky to get one at all.

Last Saturday one of the deep freezers went on the fritz and the cook in our lodge said we need a new deep freezer. We needed one right away so guess what deep freezer we got - the one the retailer had. And I am not sure whether it is energy efficient or not. What I am saying is that B. C. Hydro has got to be interested in getting people together, the retailers and so on, to handle and advertise the merchandise that will give us these savings because it is not available in Kamloops.

The other thing we are going to have to do, after hearing Mr. Lovins, is find local people who are interested in manufacturing these items because we can do all of this missionary work, but if we cannot buy the product locally and easily the whole thing is going to fall flat.

John Sheehan

I think that very vividly demonstrates the point that I made earlier. You could legislate energy efficient motors, but all you do is make many people annoyed at you for having to pay much more for the motor. You have to first educate the people. You have to convince them they should at least give it a chance. If you can get to the point where they are enthusiastic, our job is done. Other utilities throughout North America and the world will discover more things and we will have to constantly re-educate as far as saving energy and reducing the bill.

I had lunch with some senior people from the manufacturing unit of Westinghouse who make about five different brands. We were discussing the new legislation in California and what Ontario is going to come up with in the near future as far as energy efficient motors and appliances. They were complaining bitterly about air conditioners, where the increased cost of one is about $25 because of a more efficient motor. They say that the savings in electricity from Ontario Hydro will only amount to two to five dollars a year. They wonder how that can be justified under any circumstances. It does look odd. However, they are completely ignoring the fact that the electricity cost is going to go up significantly in the future if we do not take the pressure off the demand for new plants.

If we cannot convince senior executives of these manufacturers that it is a good thing we have a long way to go. We have a lot of opposition. You are still going to be getting the inefficient motors out there when there is only one of them available unless we can do our missionary work in the early stages with a broad section of the population.

There is a huge problem out there. It is not a case of starting little programs here or there. It is a complete re-education of the population as to the value of the electricity and the value of efficient motors.

Hedley Palmer

I have a couple of odious examples. It would certainly substantiate your position. At Ontario Hydro we grandly thought that we should do something about high efficiency motors in industry. There appeared to be a lot of technical potential so we decided that we would start a test market for these motors in a couple of cities. We went out with an incentive that was good enough to cover the difference between the standard motor you might buy off the shelf and a high efficiency motor in a wide range of sizes from one horsepower to 100.

We handed out literature to all the distributors in the area who handled motors and to all the electrical contractors. We did likewise with the industries throughout the area. It was a non-sell. We discovered that the manufacturers did not have enthusiasm to sell the high efficiency motors over their standard product. I expect it was a matter of profit margin. The distributors, not feeling any pressure for the demand from industry for high efficiency motors, did not stock them. When customers came in to buy a motor, they came in because the motor had failed in their operation and they needed a motor that afternoon. They would ask the distributor what they had and they would buy exactly what was on the shelf. The distributor might tell them that if they buy a high efficiency motor they can have it here in two weeks in which case Hydro will give them a payment that would more than cover the difference in cost. Seldom did they want to do that. The issue here is not how much money you will pay. We have got to do a tremendous job of changing the whole infrastructure of the motor business in Ontario. There are many ways to go about that.

My second example has to do with electrically heated houses. There are over 400,000 of them in Ontario and they probably could, if there were some insulation measures taken a house would reduce demand on our system. We find that the building infrastructure in Ontario, those people who build houses and do renovations, have no spare capacity to carry out this work. There are not many skilled trades people out there who can do what you want. We are now beginning to think that we may have to spend half a billion dollars over a period of three or four years to develop a cadre of professionals. That may be the first thing we need to do in order to capture this potential. It is not going to come cheap, no matter what Amory Lovins says or any other people. It is a major job. We think the customers will buy in, but they have got to get the 'good' goods. That is a major challenge.

Zak El-Ramly

There are always different ways of looking at things. I will play the optimist. If I look at your four examples, I can look at it very positively when I say we have a convinced consumer. He is looking for energy efficient appliances and lighting. Perhaps because you are too close to Hydro, we have managed to convince you. If we can extrapolate the experience then I am sure that with the help of our customers and with people like you, we can probably win half the battle. Once you demand it again and again the market would have to respond.

I will give you the example of the lighting program. When we started back in December of 1987, I myself did not know more than one or two of these products. I asked people in our department to go out in the field and buy every single efficient light bulb that they can find. In a week we had about seven. We started ordering them and we could not find them.

Then we had a project with EMR. Three months later supplies were bringing in all the new products. They were coming in and asking us. The price dropped from $19 to $9.50 and that is in only four months. I agree with what all of you have said. We are at the beginning of a long process and I think it is necessary all of us believe that it is going to succeed. Hydro cannot do it by itself. It is not fair for everybody to assume Hydro has to change their industry. It is a collective effort.

Ralph Cavanagh

I do not want to suggest that it will be easy or cheap. I want only to say that it will be easier and cheaper than the alternative. I think Zak would agree with me that all of the problems that he has gone through in getting those light bulbs might be nothing compared to what he would go through if he were trying to build Site C.

We have got to measure the trouble, the cost and the social difficulty against the alternative. All Amory would contend and all I would contend is that it is better than and easier than the alternative.

Unidentified Speaker

I accept that. You have got to be sure you are doing the right thing. If it is to persuade customers to do it, that is great with some incentive. But it may not be the customer who is saying that you have got to work on in order to make it happen. There may be other parts of the whole societal infrastructure that is more important than theirs where you have got to spend some time and bucks if necessary in order to get the thing going.

Tim Newton, B. C. Hydro

I stood up too fast because at that point I had just heard the stories that had not worked and Zak then added a couple that did. To pick up on Mark's point which is that we can learn from successes as well as the challenges that we have had to face. I would like to tell you about two little successes that we had.

One was double glass. I was looking at the energy use on Vancouver Island. It turned out that about 15 to 20 percent of new homes were going in with double glass. I looked again about three years later and at that point between 85 and 90 percent were going in with double glass. Being an economist I assumed that it was the rise in energy prices that have done that so I got hold of a pen and I calculated out that, in fact, the price of double glazing had gone up faster than the energy prices. Obviously that was not the reason. I looked a little further and found that somebody was now manufacturing double glass on Vancouver Island so that you could go into the corner lumber store and buy them locally. You did not have to order them from Vancouver. Certainly that was an important lesson.

The other story was when we were persuading customers to put in some equipment in their system which would knock their hot water heater off when we wanted it off. Our first representative went out and came back without any success. We sent out a second one and that time we had a terrific success. We wondered what the difference was. It turned out it was the method of the people we sent out. The first one had gone around saying would you mind awfully if we did this to you. The second person said, "Boy, have we got an offer for you! We can take part in an exciting experiment. We will give you a free jacket to go with it". That person got them to sign up.

I would like to ask Ralph if he knows of utility efforts to develop infrastructure that supports conservation in the community. I would like to challenge John to go from where the Chairman mentioned yesterday that we might look at encouraging supply by putting in orders for demand side management. Can we carry that a little bit further. I know we have done it on the supply side. We purchased concrete poles and transformers to help local manufacturers. Is that the sort of thing we can see on the demand side as well?

Ralph Cavanagh

I have urged all of you to order from the Bonneville Power Administration its evaluation of the local economic impacts of its conservation programs which it published in 1984. It is a comparison of the local economic impacts of conservation investment versus large central station power plant investment. The report was prepared for Bonneville by Charles Rivers and Associates. It includes an abundance of anecdotal evidence of the kind of thing you just described. When we did the Hood River conservation project in Hood River County, Oregon, one of the things we did was hang double-pane storm windows on the single-pane windows that were prevalent throughout Hood River.

Our calculations indicated that double-pane storm windows are cheaper per kilowatt hour saved than single-pane storm windows. The point that has not yet fully been realized even in this climate and this economy. Nobody was making double-pane storm windows in the Northwest. But the introduction to an entire county to hanging those windows over a two year period convinced two window manufacturers to set up facilities in the county to produce the products. The results are now hanging on windows all over Hood River county.

The point of most of these technologies is that there is nothing particularly mysterious or daunting about the creation of the product. And there is no reason why an economic development oriented B. C. Hydro could not make part of its effort to build the infrastructure. Make part of the investment not in payments to customers to make particular choices, but in investment in the infrastructure itself.

We are now developing appliance efficiency programs in the Northwest where the incentive will be targeted not at the consumer, but at manufacturers and wholesalers. They will be offered an economic reward for convincing customers to elect more efficient appliances and for marketing them more effectively than they have in the past. Our suspicion is that that it will resolve in more efficiency more quickly and it will avoid the free rider problem that Zak is worried about where we would be paying some customer to buy an appliance they were going to buy anyway.

If we target the manufacturers and we give them rewards based on improvements and efficiencies awaits sale of the products they are shipping, the only way they can earn those rewards is by changing the purchase patterns of customers. In the spirit of information and technology transfers all of those plans can be made available to you through the research groups that are putting them together in the Northwest. They would be glad to do that.

John Sheehan

To carry on with Tim's challenge, first of all, the two charges you made were unfortunate. Many people have the impression that Hydro buys at the lowest bid. We do not. We try to buy the best quality at the best price. We are obliged by law to go for public tender but it is not the lowest price that always wins. We have supported local industry. All provinces do it. Tim mentions concrete poles. There was a company in financial difficulties and we supported them one year by buying more poles than were needed. Two years later they were still in difficulty and we bought more poles. Unfortunately, we ended up with eight years' supply of concrete poles.

We did the same with transformers where two manufacturers of transformers were reduced to one in B. C. For our own safety we made a decision that we wanted to have a more secure supply by keeping that one in business here. At one stage we ended up with 40,000 transformers, but we do not have a manufacturer of transformers in the province anymore. These were two unfortunate examples, but let us look at the positive side.

The positive side is yes, Hydro has and will continue to take risks and put out large contracts to get a supply. But yes, we are negotiating for that sort of thing and we would be willing to do it also in relation to the products we have been talking about.

Maura O'Neill, O'Neill and Company

In reference to the model conservation standards in the Northwest, the Power Planning Council of the Northwest developed these standards in 1982. In 1983 and 1984 I chaired an advisory committee in the city of Seattle to hammer out agreements to become one of these early adopters. I volunteered about 300 hours. It was a painful process of everybody coming together. Because there were so few jurisdictions who wanted to become early adopters, Bonneville started a marketing plan called "Super Good Sense". Six years later we have a dozen or two early adoption jurisdictions in the Northwest and we have 110 Super Good Sense utilities. While I used to be a tremendous fan of legislative approaches, I would caution you that it is more painful and perhaps not as quick a solution as it might look at first glance.

Ralph Cavanagh

In retrospect I agree with you.

John Hague, B. C. Utilities Commission

In reference to Ralph's comments about how people perceive price for energy, I do not think we really do know how we perceive price for energy. Let me give you an example. I am supposed to know about these things and yet I have opted for the equal B. C. Hydro's billing plan. This bill contains not just electricity, but is my total energy bill from B. C. Hydro - gas and electricity. That is completely satisfactory to me. It may be irrational by some measurement, but I liked it that way. The pricing message here needs an awful lot of attention not from the producer mind-set, but from the market mind-set. Pricing is not a science at all. To extend this a step further, the problem for us is much worse than just having to settle on one price trigger. The end-user has a price trigger and we all have a problem in understanding that whole effect. But, in the marketplace today, we are going to be looking for entrepreneurially oriented companies to deliver product and process conservation solutions.

The second price trigger B. C. Hydro has not made clear to me and I am supposed to understand these things. Over the past day and a half I have not discovered the price trigger for me or some entrepreneur to advance a conservation solution.

One comment about Bonneville, please do not follow their pricing model. I do not think they have done a good job of understanding the price mechanism. They had a horrible problem as we did in terms of this demand curve that looks like it was an extrapolation when it was really an S curve, a product life cycle curve which we have since learned. They had to buy fast so that they could have conservation solutions. They paid at least 80 percent for the conservation solution per use without really understanding that they could have paid as little as 50 percent. BPA has not re-evaluated that. Please do not spend 80 percent when you could get more for less. We have to find the optimum. Do not follow BPA's quick fix.

Ralph Cavanagh

In BPA's defence let me say a couple of things. First of all, I think the only thing worse than spending 80 cents on the dollar is having to spend a dollar on the dollar if you cannot get the conservation in. And second, Bonneville has cut back dramatically on its 80 cents on a dollar program. The one you are referring to is the weatherization program, where Bonneville have cut the budget by two-thirds in light of the current surplus condition. The only conservation Bonneville is now paying 80 cents on the dollar for is conservation in low income households which is being done on a social grounds rather than resource grounds. As a resource, the product is still cost-effective.

I want to endorse much that you said about the importance of you, as an end-user having a good price signal given to you. What is it that B. C. Hydro is prepared to pay? Let me suggest one mechanism for delivering that signal to you other than through the rates structure although I do not want to suggest that rates do not matter. I do want to suggest that they are not a complete solution. I want to give you, an end-user, something to think - an auction for 100 - 200 MW of capacity. That auction is going to be focused solely on generators. Parallel generators are going to bid for the right to supply the province. There will be a winning set of bid prices that establishes what additional power is worth.

While I yield to nobody in my admiration for parallel generators, I do not think they should have a monopoly on the ability to get into that marketplace. This offers an opportunity to create a marketplace that sets what conservation is worth by direct reference to what other suppliers are charging Hydro for the right to supply energy the province thinks it needs. You, as an end user, ought to be able to bid against all those parallel generators who will compete for the right to provide the same services which they now see a very profitable turn on.

DEMAND SIDE MANAGEMENT

QUESTIONS AND ANSWERS

DEMAND SIDE MANAGEMENT QUESTIONS AND ANSWERS SUBMITTED IN WRITING BY FORUM PARTICIPANTS

Q. Has Hydro considered load dumping schemes, such as those done by some utilities?

A. Hydro is considering this approach in some areas where capacity limits are anticipated in the distribution system. However, this is not expected to be a major DSM strategy in the short term, as Hydro is energy bound, rather than capacity bound. That is, we have more than sufficient generation (capacity) to meet peak loads but, our ability to meet total load is dependent on the amount of water in the reservoirs (energy). This is a basic difference between our hydroelectric system and many thermal generation systems.

Q. Why do you charge for your data books, which are intended to assist customers in increasing energy efficiency? Why not provide them free of charge to get broader usage?

A. The current charge for the data books is $20.00 to our customers, and $50.00 for non-customers. The $20.00 is a minimal charge and covers the cost of printing and a portion of the handling. The purpose of the charge is to ensure that the book goes to individuals of companies with a serious intent to use the material. It is not felt that the $20.00 charge is a barrier to anyone who is interested in obtaining the information, but does "filter" the casual inquirer. Individual data sheets are available at no cost.

Q. It was mentioned at the panel discussion that DSM programs may cause the unit cost of power (i.e. the price per kW·h) to increase. Doesn't this inhibit new development as most, if not all, expansion of new plant studies look at the unit cost of power, independent of energy efficiency?

A. The current DSM programs, as a whole, are expected to decrease the unit cost of power, relative to what it would be without the program. However, a number of utilities and utility commissions in other areas have accepted programs which increase the unit cost of power, as long as the customer's total power bill has decreased (i.e. the cost per kW·h increased, but the level of consumption decreased sufficiently, such that the total energy bill decreased).

Hydro is currently reviewing its policy on DSM program costs and is considering the price impact.

Q. Is Hydro considering changing its rate schedules to phase out the less efficient mercury vapour and incandescent street lighting?

A. Yes, Hydro is considering restructuring the street lighting rate schedules with the intent to promote more efficient lighting.

Q. All gas utilities in B. C. except B. C. Hydro Gas offer grants to their customers to assist them in changing residential hot water usage from electric to gas. In order to reduce load, would it be possible for B. C. Hydro (Electric) to assist these other gas utilities with grants?

A. A pilot program in cooperation with Inland Natural Gas has been approved and is planned to proceed in the fall of 1988.

Q. Are domestic natural gas water heaters and/or conversions to natural gas or propane water heaters allowed in new or existing mobile homes? If so, what are the appropriate standards?

A. Yes they are, and some gas utilities are actively promoting the conversion of electric hot water to gas. The gas hot water tanks must meet CEA standard Z240.4.1-M1983. Not all hot water tanks meet this standard.

Q. Will B. C. Hydro support new high efficiency lighting installations, such as high pressure sodium or mercury vapour, for improving greenhouse production on a year-round basis?

Support could be through a capital cost contribution, lower electric rates, or contribution towards energy management control systems in general, as part of B. C. Hydro's new DSM policy.

A. B. C. Hydro and the Canadian Electrical Association are currently testing the use of high efficiency lighting systems for greenhouses. The objective is to optimize the period of radiation and crop growing. When these tests are completed, and it is possible to determine the costs and benefits of this approach, Hydro will consider the possibility of a program in this area.

Q. I looked for energy-efficient light bulbs at London Drugs. None were available for sale. Shouldn't the first step to a DSM program be to get them on the shelves?

A. Before we can address the residential market, this is certainly true. As of today, energy-efficient lights have limited availability and can be obtained locally through lighting stores such as Thunderbird Electric. However, the initial program will concentrate on the apartment/commercial segment, and the lights are readily available through electrical wholesalers and contractors.

Q. Will B. C. Hydro entertain proposals from industry to cost share plant improvements that lead to lower power use?

A. Yes. Later this year we expect to develop a policy to address proposals from customers. It is reasonable to assume that such a policy would require a minimum level of savings before we could consider assistance, due to the level of "transaction" cost of dealing with individual "custom" proposals. In addition, a monitoring scheme would be required to ensure that the expected energy savings do occur.

Q. DSM is expected to increase the per unit cost of electricity yet Hydro is offering 2.5 to 3.0¢/kW·h. This does not seem fair.

A. The current package of DSM programs is expected to lower the cost of electricity over the long term by postponing the need for new generation. The DSM programs have been compared with parallel generation to try to achieve a fair application of financial incentives.

PANEL DISCUSSION: PARALLEL GENERATION, SUPPLIER/PUBLIC/UTILITY VIEWPOINTS

(EDITED TRANSCRIPTION)

PANELISTS: ED MACGREGOR, Energy, Mines and Petroleum Resources
CHRIS BOATMAN, B. C. Hydro
BOB MUSSETTER, California Energy Commission
ARIE VAN DONKELAAR, Cariboo Pulp and Paper

PARALLEL GENERATION PANEL DISCUSSION

10 JUNE 1988

Panelists: Ed Macgregor - Chairman
Chris Boatman, Bob Mussetter, Arie Van Donkelaar

Ed Macgregor

I believe that the panelists have made their statements or presented papers this morning and you have heard from a number of speakers on the subject of parallel generation. For us, who are involved in the Energy Ministry and the Energy Policy side of things I would like to congratulate Hydro for organizing this forum. It is a very useful opportunity for us to hear the views of interested people as we move into this relatively new area for British Columbia. And there are some obvious areas that we have to be concerned with and some significant opportunities that can arise if we are able to tap parallel generation as a source of electricity supply.

Unidentified Speaker

I do not have as much a question as I have a comment. As I asked yesterday, who from Hydro is going to be in charge? We are still a bit away from Ontario Hydro's position. I think it is imperative that we as generators of electricity, as small developers, go away from this meeting with the idea or the knowledge that somebody within Hydro is going to be a contact person and that contact person has the exact guidelines as to what our power will be bought for, how we are going to get paid, and how long it is going to take to get down to brass tacks. I have been making electricity for six years. My discussions with Hydro have been limited because all I ever got was a no. No discussions, period. If B. C. Hydro is moving into the direction where Ontario Hydro is already at, then let us get to where Ontario Hydro is. They have somebody in place. I have seen the published rates they pay, and as long as we can go away from this meeting knowing there is going to be rates, who to deal with, the time element and all the other things involved then that is fine. But if we go away with the knowledge that it is going to take another two or three years to get to the stage Ontario Hydro is at then it will be no better than the way it has been going for the last six years. Let us get on with this and get down to brass tacks.

Chris Boatman

I think the gentleman's question was dealt with a little yesterday. You will see in the draft policy paper that we have nominated a gentleman, John Elliott, our Manager of Interutility Marketing, to be the window into the corporation. John has not been completely armed yet by the corporation with all the answers you are looking for, but then this conference was set up so we could get some more input before those things were finalized. It is our intention that once the policy is finalized and issued, one window into the corporation is the way that things should be carried out. I think we have designated somebody who will ultimately be responsible. He is designated in that draft policy which is in place now.

Randy Hadland, Peace Valley Environmental Association

We had some input into the Site C hearing process before the B. C. Utilities Commission and we would like to congratulate Hydro and the Ministry for this proposal. It is a good first step, but all of the problems that were brought up this morning, or a lot of the problems, seem to me could be handled by the B. C. Utilities Commission. It seems to me that body was designed to meet a lot of these concerns. What is the future for the B. C. Utilities Commission in this process?

Ed Macgregor

I think I understand some of the concerns you are expressing. Certainly there is a continuing role for the British Columbia Utilities Commission. You may or may not be aware that there has been a Bill introduced in the Legislature which provides some amendments to the Utilities Commission Act. It is not law yet. It has to be debated by the Legislature. It makes provision for the Utilities Commission to be the vehicle through which terms and conditions are determined under which a public utility will wheel power for third parties, parties other than public utilities. It will have some powers to review the kind of contractual arrangements that are entered into to ensure that the utility is kept whole. There must be just and reasonable rates, and that kind of service must be in the public interest. The Utilities Commission will have a very central role in dealing with the use of the utility's facilities and in facilitating exchanges between parties other than other utilities.

Randy Hadland

One of the recommendations I believe is contained in the Site C report is that, before B. C. Hydro embarked on any future energy expansions, there would be a hearing to determine what sort of costs were involved. This is a large part of the problem of setting up alternative energy or cogeneration systems, and conservation for that matter. My impression is that this analysis has not been done. We are still arguing about it and debating it. Is there any chance that the B. C. Utilities Commission will be involved in that process?

Ed Macgregor

I think you are referring to the next increment of supply that a utility will bring onstream. In looking at B. C. Hydro's 20 year Resource Plan there is a suite of options they are considering - demand side management, private sector generation, purchase, interutility purchases and so on. I think the whole purpose is to find the most cost effective increment of supply and whether that is supplied by the public sector or the private sector is something one cannot determine at this point in time. The Utilities Commission will certainly have an overview in terms of the utility's acquisition practice in that regard.

Jim McDonald, McDonald Ranch and Lumber

I would like to ask Bob Mussetter what he would say is a reasonable rate that B. C. Hydro should pay to people that can provide power to the grid. Knowing what some of the people in California are getting, I was wondering what you would think.

Bob Mussetter, California Energy Commission

That is the best question you could have asked. We are going to go into bidding now. We put the old contracts behind us, the contracts which were created by the scheme that our entrepreneur so reluctantly proposed this morning.

Normally, business operates on a more or less bidding proposition. Very frequently people negotiate privately with one another or you cast about the market for whatever it is you are looking for whether it is an automobile or a big plant. The bigger the investment that is being made, presumably the more you know about what you are doing. Therefore, you are in a position to make judgements as you go along about the reliability of the purveyor.

I do not know the answer to your question and I do not think anybody in the room does. All that should be paid is what you have to pay to illicit from the market that quantity that you require and again do not forget the quantity side of it. Do not let a board establish a price without quantity parameters attached to it. Bidding in itself, once you get into that concept, has many tricks and ramifications. There are all kinds of schemes that can be presented.

I should mention that when the California system was established the thought was that these were going to be "Mom and Pop" industries. After the prices were set and the market changed making them lucrative, fixed price contracts became extremely profitable. All the big financial institutions, whether they are engineering firms, money lenders, or industrial firms of every kind were attracted. We see plants which are 50 MW and larger at the Energy Commission while we see practically no small entrepreneurs. It is all oil companies, U.S. Borax, Kerr Magee or something that is half owned by Edison. PG&E just entered a partnership with Bechtel to build these plants turnkey. You can have all kinds of very idealistic hopes at the outset, but if you create a terrific mousetrap you are going to catch some big mice.

I would expect that the prices in the two regions will tend to run together. There is too much to be gained here on both sides. Whatever your costs turn out to be, at times you are going to want to sell to us and maybe vice versa. I do not know, but a lot of the time we will probably want to buy from you, so I would expect that after a decade or more prices are going to run together. Ours will decrease and yours are going to increase. You may not like to hear that, but I expect that is what will happen.

Jim McDonald

If a proper price is paid we have more energy on the western side of North America than in all the rest of the world. I would like to compliment B. C. Hydro on what they have done to set up this panel and set up this program and the forum. The three Cs have given us insight.

Arthur Hein, Hipp Engineering

When we compare our B. C. situation with most of the American situations their incremental costs of new power are quite high and that sets the cost that they are willing to pay for parallel generation. In B. C. we have Site C. That is the measuring stick, and it is a big block of power available at low cost. It is going to be hard to compete. When you issue your proposals or requests for inquiries in the Fall and we submit the proposals for cogen plants we are not going to be able to compete with Site C. And if that happens this whole exercise is going to become a justification for installing Site C.

Bob Mussetter

We are not in a position of creating business for you. The person we are supposed to be interested in here is the rate payer out there who is paying the bills. Let the chips fall where they may. If Site C is the better option, then that is the way it should go and if yours is the better option, that is the way it should go. We ought to have a fair evaluation. No stacked deck, but that is difficult to achieve too.

Chris Boatman

It is a matter of belief in the marketplace. Your analogy may well be correct. There may be nobody who can compete with Site C and I agree with Mr. Mussetter that we intend to go with the marketplace. However, I would like to believe that the situation will be different. If you look at the experience in other jurisdictions, given the prerequisite that our costs are much lower because of the hydro facilities we have, the amount of generation that has come out of the woodwork under processes like these, that have been competitive, has far exceeded anybody's expectations. We would like to be a little more optimistic. If in fact we are wrong, and Site C is the cheapest alternative, then presumably for the rate payer that is the alternative that should be selected.

Unidentified Speaker

I saw $3 billion for Site C. Is that right? $3.2 billion even and it is 900 MW. What is cheap about that? What are you worried about?

Clyde Coats

What Hydro could do for cogeneration, parallel generation is provide long term contracts with a five year contract - it does not matter whether you are big or small, the banker does not like you very much. The first thing is to forget five years and start at 20 years. If it is a good operation and Hydro really wants it, perhaps even go to 30 years, if that is what the amortization schedules favor. If you cannot finance you have nothing. The other terms of the contract are critical. A number of them will vary from site to site, but in my recent negotiations Hydro has taken a quantum leap in contract wording. The quantum leap they have not taken yet is overcoming the fear that a small person may make a profit. I understand the risk in the public eye if suddenly I make a lot of money and it ends up in the paper, "Hydro Gave the Store Away". Heads will roll and politicians will roll. Compromise, Ontario's price is roughly 5¢ a kW.h, Alberta is coming out with a fixed rate in the next two weeks. Hopefully Hydro will be in a similar price range. But small hydro, if they go on their position paper they presented today, is dead for a number of years. But this is just a position paper and Hydro is changing so fast I have great faith.

Chris Boatman

I agree with most of what Mr. Coats said. A lot of our discussion did focus on profit and what is a reasonable profit. There is no argument that we come from different points of view. Fortunately, in this instance we were able to resolve the differences. That is why I am optimistic. None of these negotiations are going to be easy. We have certain interests to protect. As we have said, we are here to serve the customer as a Crown utility, but I am optimistic we can meet and negotiate contracts in situations where the best facility gets built.

Floyd Lundstrom, B. C. Forest Products

Two questions. One, you are probably going to be rushed by people from the pulp and paper industry with ideas on cogeneration because most of us have more hog fuel than we know what to do with. One of the things you want to consider, when you take a look at converting hog to steam to make power, is the very big capital cost. Also, hog is a nuisance. There are other factors that should enter into this besides just the cost of the installation and selling the power. If you drive towards Williams Lake and you go through Quesnel, you see burners burning. You go through other sawmill towns and there is a lot of hog fuel that is just being wasted. I do not know if that is part of your policy since we are in our infancy here, but I think that when you consider cogeneration there is more than just the economics, there are many other impacts.

Second, there are going to be a lot of people asking, 'Do you have enough people to look at these?' Also, do you have a limit on how many megawatts of cogeneration you want to purchase because you may end up with 10 times as much as you are prepared to buy? What is going to happen to the rest of the people that do not make it? Do they go on a waiting list or do they wait until the price gets a little better and then bid? Maybe you cannot answer all of these questions at once, but a lot of us are sitting around here saying this is not enough money. This may be economical now and if I sign a 20 year contract now and my friend from Quesnel signs one in two years at 3¢ a kW.h more what happens here? I would like some answers.

Chris Boatman

You have hit on a very important aspect. Since we announced approximately six months ago that we were going to encourage parallel generation or cogeneration, we have been inundated with people. And certainly a part of our consideration is how do you bring some semblance of order to that situation, hence the idea of a proposal call.

During Mr. Bell's opening remarks he touched on a process where a proposal call would be made on an annual basis, probably in the Fall of each year. We would have to look at the load forecast which is done in July and make a decision as to how much generation we could call for at a specific time. Some years it may be zero if the load growth does not materialize or something else happens. There is no guarantee. The first requirement must be need. And you are right, we do not have all the answers yet, but we must look towards some process that allows people to know when to bid, to make decisions on whether they are going to bid now or leave it another year. There may be an opportunity next year or there may not. The vagaries of the market will determine a lot of that.

Unidentified Speaker

Would the final authority be some sort of a board. For instance, if you are burning hog in the Interior you do not have to dry it. It is usually very dry. If you are burning hog on the Coast you have to dry it. That is not too hard to do when you get your boiler up and you go through the flue gases, but up until you pay for that hog dryer you are adding an extra cost on a boiler that you would build in Vancouver that you would not have to build in Quesnel, and is that part of the equation.

Chris Boatman

All the things you have touched on need to be part of the equation. When you go for proposal call it is not a final selection process of itself. It is identifying those that are interested. The things you have talked about will be factored into the equation somehow. You are right, we do not have all the answers yet, but for example, should there be more paid for energy if it is produced in Williams Lake and helps to solve the fly ash problem? Maybe the answer is yes. Then the question becomes should the utility pay for that, should the utility's customers pay for that or should some other mechanism be found to generate those additional funds for that development to take place. Very good questions. We do not have the answers and that is what we have to work towards. Whether the evaluation should be made in the end by the utility or whether there should be input from government, whether it should be done by the Utilities Commission should be reviewed in an attempt to level the playing field, but it is never going to be a level playing field.

Unidentified Speaker

One final question. If I or someone representing our company got in touch with B. C. Hydro within the next week would we see some action from those persons coming to our plant to have a look at cogeneration or would we have to wait three months? What would happen?

Chris Boatman

I do not know how quickly we can move. We will move with all the speed we can in incorporating comments from this Forum into our final policy paper. We have been telling people who have been writing to us at the moment, that we will share information with you the best we can, but our intention, when it comes to selection, is to go the proposal route. I hate to comment that a utility the size of Hydro does not have enough people, but as somebody said we have gone from an organization of 10,000 to one of 5 or 6 thousand and some of that is going to disappear over the next few months. We really do not have a lot of staff.

Ed Macgregor

A supplementary comment. Your points are well taken with respect to some of the other factors that might be taken into account. Certainly, anyone that is knowledgeable about the Interior knows that there is a problem with woodwaste and its accumulation. There are disposal and air emission problems with incineration. Therefore, there probably is more than just the utility involved in attempting to resolve that issue. There is a cost associated with disposal by the industry which must be factored into the piece, and if one is considering options of how to affect that disposal in a more environmentally acceptable way there is some cost sharing that presumably might be considered in that regard.

Bob Mussetter

I want to address that issue before it leaves us.

At the Energy Commission we are continually confronted with the question of doing some social good paid by the electric rate payer. The classic example was municipal solid waste. Most of our big cities, particularly the Los Angeles area, are running out of solid waste landfill sites. The answer to this story is not told yet, but we have wrestled with the problem. We admit that there is a general social problem. However, the creator of the garbage problem is not identical with the rate payer matrix, so that, if you are going to do anything other than furnish electricity at its proper cost to the rate payer, if you are going to tack on some surcharge that finds its way over to the L.A. County Sanitation District, then you are automatically creating some inequities because there are certain industries that create large quantities of waste.

We have looked hard at the problem, studied it, and come to the conclusion that the best economics is to have the electric rate paying system stand on its own feet and the garbage problem stand on its own feet. If you do anything other than that you are sending the wrong price signal to the person who creates the garbage. It does not matter if it is a residential person or who it is - my experience in a small municipality is we tend not to charge enough to the individual homeowner for disposing of that problem and that we need to have the courage to face up to it and charge what it is worth. The problem will then quickly be reduced to manageable proportions.

Unidentified Speaker

I am a part owner of the site in Britannia where either 5 MW or 10 MW of hydro power could be developed very quickly because the old dams are still in place, even though they require quite a bit of work. We would like to know what B. C. Hydro's policy would be on the payment for power, whether it is on the basis of continuous power. Would this kind of operation would be classed as continuous power or would it be classed as interruptible power and only taken on a when and as needed basis? Also, we feel that we can develop the site up to 10 MW for probably less than $1.5 million per MW. Is this a competitive figure?

Chris Boatman

The question of price depends on the product you are asking us to buy. In the recent negotiations we had with QCPC, part of the negotiations was defining the product. We were talking there about needing a continuous supply, certainly needing a continuous revenue stream to finance the project. That need for a continuous revenue stream had to be balanced against the product that was being offered. I think that there is a market for all sorts of products and I cannot give you hard and fast rules that say we will only buy this type of product or the other. We have to evaluate each product and if there is a need for it at a price that is competitive then, presumably a deal can be made.

Unidentified Speaker

I am not an electrical person, but the product is kilowatt hours.

Chris Boatman

There are different prices.

Unidentified Speaker

My equipment has to be paid for whether you buy or not. Are you paying me so many dollars for my product, whether you need it or not? What price would you pay?

Chris Boatman

That is the point. You need a take or pay contract to finance the work. We need to decide whether we can afford to pay the value of your take or pay contract not knowing the product. Is it interruptible. Is it there all of the time. Is it there part of the time. Part of the negotiations is deciding what we are prepared to pay.

Unidentified Speaker

Your answer is in line with that joke about the economists, on the one hand this, on the other hand that. The problem when we deal with people like you is you do not give answers.

Chris Boatman

I am sorry, but in my opinion these are all different. There are general guidelines and without knowledge of your specific situation I cannot give you specific answers.

Ed Macgregor

Chris, could comment on the basis upon which you may tender for incremental energy in terms of its shape - firm or interruptible? Will there be something included in the call for proposals which would give prospective generators an option to the type of supply that you want.

Chris Boatman

The discussions we have had to date focused on firm supply. The system we have tends to create in most years considerable secondary energy that has been sold out of the province. I am not sure that there is a market for more secondary energy, but we have not yet firmly decided what would be included. Firm energy is what we have been talking about.

Randy Hadland, Peace Valley Environmental Association

I neglected to mention that I was one of the early people that got an agreement with B. C. Hydro to purchase my power and that would be on the trailing rate system. I am a little concerned by this proposal because if I ever get my windmill going again I am going to have difficulty making any kind of return on it at the kind of rate you are paying. I do not think we should be accepting B. C. Hydro's interpretation of what its costs are because there are costs that B. C. Hydro is not responsible for. The Ministry used to do a fairly comprehensive and indepth analysis of forecasting electricity. Are you still doing that?

Ed Macgregor

In alternate years we put out a comprehensive supply and requirements forecast which covers a 20 year period. In the past year we have put out a five year forecast. Late this year we will probably put out a 20 year forecast.

Randy Hadland

Are you taking into consideration potential export markets?

Ed Macgregor

We only consider export markets if there is an authorized firm sale contract. We do not speculate on what the export market might be, rather we forecast what domestic requirements are, the domestic supply from all energy sources. We only take into consideration those firm commitments which have some call upon resources that are currently in place.

Randy Hadland

Could I get a copy of a report like that?

Ed Macgregor

It is available any time you want to write to us. I believe there is a small charge.

Bob Mussetter

The QFs in California refer to your frustration as "wrestling with a 300 lb. gorilla". That is how they describe trying to negotiate with PG&E or Southern California Edison.

Jack Horner, Bonneville Power Administration

I offer some observations about an experience we had. In December 1980 the Regional Act was passed by the Congress and signed into law. It allowed Bonneville to acquire resources based on a need for resources for the first time beyond the period of five years. We could go out for the life of the resource, up to 35 years. We were also placed under a priority of acquisition. The highest priority was conservation and it had a 10% price advantage. Second was renewable resources, third was resources of high thermal efficiency and fourth was nuclear and coal plants.

I was assigned the task of putting together a request for resources which we sent out in August of 1981. At that time we had not yet offered new contracts to our customers, nor had the customers had them in hand, nor had they decided to sign the contracts. We were going after resources on the basis that a sizeable deficit still forecasted for the region. We were not sure how much we needed, but we thought we would get started by looking at this.

The particulars of the request for resources was for anything larger than 500 average kW, which was relatively small, and it had to be on line by 1986. We were prepared to buy either capacity and capability. We would buy capability where we would guarantee the fixed cost if we did not want the project to run after we acquired it, or we would buy energy output only. One problem with a request for such a small magnitude was a lot of sponsors had resources whereby we would have had to negotiate wheeling contracts over the local utility district. We have something like 115 preference customers plus the industrial run utilities and in order to get these resources to our system we had to negotiate wheeling contracts with each of the utilities where that project was located.

We received 74 proposals ranging in size from 500 average kW up to shares of WPPSS nuclear plant no. 3. We had a large range. We even had one elderly woman who had grown up on a sheep ranch and submitted a proposal where she proposed dropping nuclear pellets in reservoirs to increase the output somehow. I never figured that one out.

Out of the 74 we evaluated, we eliminated a number because they were not in the appropriate stage of development, but we did end up with 22 that we evaluated in more detail. The only problem was that in April of 1982 another area in Bonneville came out with a new regional load forecast which indicated a surplus in the region. As a result there were a lot of unhappy, disappointed and angry entrepreneurs because they had invested a lot of money in preparing these proposals.

We did evaluate on the basis of cost effectiveness, costs that included reliability of the project, availability, and environmental benefits. The end result was that we did not buy one, but I learned some things.

For one, it is not fair to smaller developers to have them prepare proposals and compete when they have 200 kW, or maybe even 5000 kW. My sense was, when this was all over, I would have preferred if we had established an avoided cost or established a price that we would then pay. We would see the utilities in that area pay for output from these small developers because by agreeing to buy all of the output, the entrepreneur can establish whether he can make money on that project or not. He does not have to compete, he is only competing with himself and how well he does against that price. We have even considered trying to prepare some environmental impact statements of a generic nature which would allow local utilities to run down a check list and decide whether the entrepreneur and the developer would meet all these requirements. He could make the decision as to whether he wanted to offer his project at that price and if it was a go or a no-go situation.

I saw it as a situation where you could have this program, not turn it on and turn it off. You could also use this approach for 15 MW of capacity and 7 or 8 MW of energy. For the big projects, let them compete and you could go into a more detailed evaluation. The Regional Act was not designed to make it difficult for small entrepreneurs to get their projects up and running if the project seemed reasonable in terms of price.

It was quite an experience. For awhile I was afraid to start my car without looking under the hood. The only project that Bonneville has purchased under the Regional Act turned out to be an unsolicited proposal from the city of Idaho Falls restoration of their hydro plant that was washed out back in the late '70s. In conclusion, keep things as simple as possible. It is easier for the developer and the entrepreneurs to understand it, and it is easier for the utility to administer it.

Clyde Coats

I would like to reply. That was a major point in my speech. I suggested that 10 MW should be used as an upper benchmark for small hydro at a fixed price. You could get an engineer to analyze a stream. You know what you are going to get per kilowatt hour fixed and that would be open ended and in perpetuity, realizing that B. C. Hydro could not take a 200 MW load and another 50 MW plant if it had all this extra power. I would put up a benchmark of 10 MW hoping that it would not be enough. They would never go above a couple of hundred MW in total and they could still let bigger operators into the system as the system could absorb them. If that is Bonneville's approach I would certainly agree it would work well here.

I was dumbfounded when I came with 150 kW, which is roughly the power for 10 large homes, and Hydro was so concerned that I could generate power. After all they were spilling over their dams. When you speak to Hydro never drop a smart-assed comment. My comment was that when my generator started up I would be proud that when water came through my turbine and my steervalve opened a whole 150 kW came on stream and that it would push the power all the way back up to the Bennett Dam. Their turbine would change into a motor, run backwards, blow water up into the lake and they should have insurance against sinking the fishermen in the fish boats. For four weeks their legal counsel was so concerned over this, and whether I should be responsible for insurance in the fish boat, that I required a dam. I said I had some amazing experiences with Hydro. It is good that we can all laugh.

When you get below 10 MW, especially when you get down below 1000 kW, Hydro should be generous. Open up because the only people you are speaking to is "Mom and Pop" shops. It is far too small for 'a business' at 1000 kW.h. Limit the size, be fair on the price or generous, open the door to the little people and monitor those like myself that wish to put larger plants online. Make sure we fit in as Hydro requires the power. It makes good sense for Hydro and for the small person.

Chris Boatman

The draft paper that was issued to you sets that breakpoint at 5 MW, again subject to input. The paper does reflect the comments that have been made that under 5 MW we should limit the transaction costs and set a price. Whether or not you can accept everybody is probably not a problem for the system. It may well be a problem for the individual people trying to administer the multitude that may come out of the woodwork. If there is a limitation it may be set more by one's physical ability with staff to negotiate with everybody. Again, the policy does reflect those comments and we are more than welcome to accept input from you as to whether that limit should be high or low.

Jim McDonald, McDonald Ranch and Lumber

I was probably the first one to tie into the single phase with B. C. Hydro, mainly because that is the only thing that B. C. Hydro has in our area. We tied in back in 1982 unofficially. They did not know about it. Officially we did get tied in somewhere around the 1st of April in 1983 by putting in two meters. We reversed the meter. They did not know until the meter reader came. It confused her because the first time she came out to read it she noticed the reading was less than it was two months previous. She thought she had made a mistake and she came back out to read it again. Of course, it was less again. I had not paid any attention until I got notification from the man who has the same name as mine, the Manager of Fernie, Doug McDonald. He asked what we were doing with that meter down there? I said I did not know. I had not even looked at it. He told me we were about 4000 kW.h in reverse.

Nevertheless, from that experience with B. C. Hydro we have had good relations with the local manager. First, we reversed the meter and then we used the power. Of course, we had to use the power during the winter time which cost about 6¢ a kW.h, so we did take advantage of it. Later we negotiated a contract with B. C. Hydro.

Probably the thing that cost us more than anything else, even though we were only putting 12 kW into the system, was the liability insurance.

The first year that we applied for liability insurance at a level that B. C. Hydro required, it only cost about $200 a year. But for some unknown reason last year they doubled it to $400. That was about the best rate that I could get on $1 million liability insurance. Like Clyde says, we have to be insured in case anybody along the line or the workmen on the line are injured.

The trailing rate I believe is 4.084¢ per kW.h, which for what we have and what it cost us to install our plant, has been very good. I am satisfied with it until now, but when I see that 3¢ figure today I was not happy. Hopefully, it would be increased. I was hoping that the rate that you had given me would set a precedent for the rest of the potential parallel generation in Hydro and in B. C.

We have been happy with B. C. Hydro and we have had a lot of fun, even though it worked out to about 12 kW per year as we average it out. One thing that our manager keeps telling me anytime I wish we had another 400 kW plant and that is there is a rancher in the East Kootenays that is supposed to be tying in shortly. We have prepared a proposal, but we did not have time to get a reply back on it. Hopefully we can work in an intertie with B. C. Hydro in the near future.

Periodically, I drop in to see the manager in Fernie and I ask him when they can take power from our big plant. 'We are spilling water like crazy', he says, 'we have got more power than we know what to do with'. And he says, 'you know, we keep looking at the revenue you are getting from that 12 kW, we might not be able to afford to pay you anymore'. He says, 'you have already, in the last couple of years, got over $8000 out of it. That is a lot of money.' At a seminar at Cranbrook I talked about the hydro potential in B. C. I said that I was getting about $400 a month from my small hydro. I was talking to doctors and lawyers and educators and the $400 a month to them would be a drop in the bucket, but telling a rancher or farmer is different.

Unidentified Speaker

Mr. Boatman, would you agree that if Site C cost $3.5 million per MW that the new power would cost somewhere around 4 or 4 1/2 cents, and would not that be a good benchmark for continuous power from smaller operations?

Chris Boatman

Four cents for 900 MW is okay.

Unidentified Speaker

Right, and therefore could that not be the benchmark for these arrangements on continuous power from smaller operations.

Chris Boatman

Perhaps I can get John Elliott to deal with that.

Ed Macgregor

We are talking about a price per unit of capacity. But we are not talking about the energy. The gentleman said that if one considers Site C is $3.5 billion, it is roughly $3.5 million per MW. So somehow or other that got it equated to 4 1/2 cents per kW.h for the energy and capacity that might be paid to a small hydro operation.

John Elliott

I think they should go back to the marginal cost. Currently, you have a low point and you must factor other generation such as Site C into that. You have got to look at how that would fare against private costs.

Bob Mussetter

He is proposing Site C be your avoidable resource which, if you were in the United States and you were subject to PURPA, you could set your quantity and let people bid against that quantity. Then the arguments start to rage because if you over-subscribe there are different answers as to what you do. You may get a really competitive bunch of bids at around 2 1/2 or 3 cents. You did not think it was out there, but suddenly here it is. They will bid for 500 MW and somebody else will bid another 200 MW and it will increase step-wise. There is something called a second price option that has been suggested in San Francisco at the PUC. This is an attempt to build reliability into the system by awarding the contract to all those who fall under the cutoff price. I think raising all the lower bids up to that cutoff price is nonsense. No other industry does anything like that. If you carry that logic to the extreme you would award all the bids to the highest bidder.

Reliability in the generation side of the electric business looks as though it has been carried too far. If you continue with this program, and you have a myriad of generating plants, you are not going to have a power outage problem because one generator went down. The unreliability in electricity comes in the distribution end, when somebody hits a power pole by cutting a corner with a truck. Occasionally, transmission problems can cause power outages, but the generation side is not a big factor. Another thing, we are seeing that these turbines and generators are highly reliable machines, at least on the cogen side. After all, they are basically airplane engines and we are seeing them run at 90% capacity and even higher.

Chris Boatman

To comment further - the gentleman with the question was trying to compare the price that had been quoted for energy against a capacity price. The numbers that were put forward this morning were energy costs, so you must look at the energy out of Site C to come up with that cost and then revise that cost to just 3 1/2 cents. The numbers that were put out this morning and yesterday only fixed a price for the less than 5 MW. This is in line with the idea the gentleman from Bonneville put forward. He wanted to limit the transaction cost on the small proposals. The proposal is to set that price at 2 1/2 to 3 cents. On the integrated system larger projects each one would be on a negotiated basis with Hydro's long term marginal cost, set as a ceiling, that cost is to be defined on an annual basis. We have not given any specific number in the integrated area, we have given you an indication of our long term marginal cost based on Site C. What is the long term marginal cost? Mr. Gathercole can take me on for at least a month to try and resolve exactly what that number should be. When we get into discussions like this we tend to mix up the small, the large, the integrated and the non-integrated. We have to be focused when we are talking about not transferring one number. I am going to accuse my friend Mr. Coats in his speech of making an assumption or making it apparent that we were offering him the integrated price when, in fact, we were negotiating with him on the non-integrated price.

Dave Bilinski, Diamond Ranch

Somehow it did not add up to me. When you are talking about Site C's projected cost you amortized that over something like 70 years on your dam. I do not think there is any financial institution in the world that would consider financing a small generator over barely 20 years. If you are talking 3.1 cents for your production costs and you amortize that over a more reasonable time you are going to be up in the 4 to 5 cent range. Is that true?

Chris Boatman

Yes, that is correct. We are back to the level playing field and the basis on which a utility does its financial analysis. Its ability to borrow money is quite different from the private sector. How those two should be brought together is another subject for a long debate, but from the utility's point-of-view, we have to be satisfied that when the choices are made we get the best deal.

Unidentified Speaker

When you talk about "a utility" Chris, it is B. C. Hydro you are talking about because Alberta Power does not set 70 years to pay off its power plants. Neither does TransAlta, I believe. You should recognize that we live in Vancouver and that people in Vancouver developing projects in this province are going to go to the VSE or maybe the TSE for money. We have to prove to our potential shareholders that their equity is going to make a fair return in competition with other alternative investment vehicles. We have to know for forward planning how much we can get for our power, so that we can start doing a reasonable calculation before we get into a lot of money. We also must know how much we are going to get for the long term return on our investment.

Chris Boatman

I would agree with you and I think that was the idea of putting out Hydro's estimates of its long-run marginal cost on an annual basis, to put something into perspective for people to make evaluations. The details of the contract, in reference to the revenue stream, can be based on a number of things. Whether it is a levelized cost or whether you want to go on another basis, those are parts of the one-on-one negotiations.

Joe Stauder, North Pacific Power

It is unfair to have level fields and I am glad these questions came up over the cost of Site C because we are comparing apples and oranges. B. C. Hydro, when they put Site C together, can assume that they will not use all of the power for several years. If you include all of the avoided costs, like the financial payments you pay over so many years over while you are not using the power, the cost of the power would be much more than 40-45 mills. Your Chairman made a comment about Revelstoke being on time, the fact is that over those two years it cost the rate payers several hundred million dollars in financial charges. Those things are never brought forward. I wish Mr. Elliott, when he negotiates, puts all these in perspective and he should include these when he is discussing rates with the little producers otherwise it is unfair.

PURCHASE POLICY

QUESTIONS AND ANSWERS

PURCHASE POLICY QUESTIONS AND ANSWERS
SUBMITTED IN WRITING BY FORUM PARTICIPANTS

Q. Proposals have been (will be) requested for parallel generation. For those projects involving hydropower, what is the policy regarding land and water rights at a site? Will ownership of the rights guarantee the developer the right to develop or will BCH control it through contracts? Will a PURPA style gold rush develop?

> A. Site land and water rights for hydropower projects will be the responsibility of the private supplier. Ownership of such rights would mean being a party with a private supplier to provide a proposal to BCH for potential site development and sale of electricity to BCH.

Q. At what point will general technical guidelines be developed for parallel generators of all types? (Precedent may be found with numerous utilities).

> A. It is anticipated that technical guidelines for parallel generator interconnection to BCH will be available by 1 October 1988 or thereabouts.

Q. Is there a maximum size project that will be considered? Will there be anything to prevent BCH from seizing upon a good idea and developing it in-house?

> A. A site-specific project may be economic and have an energy capability to meet part of the block or the entire block of electricity required by BCH, or have capability above BCH's block requirements at a specific date. Should the potential of additional capability exist, BCH would review the impact and benefits of this total capability on it electric system development plan as it could be in BCH's best interests to encourage some form of staged project development over several years to match the forecasted load growth. BCH will respect a parallel generator's innovative idea. However, if BCH can identify projects where we could build new facilities less costly than private industry, then it is in the best interest of our customers to do so.

Q. Will BCH be looking at demand side management, cogeneration and hydro power proposals separately or by category? For example, will BCH want to pick the best proposals in each category for development or will it only look at DSM programs which may have the shortest payback?

> A. BCH will be looking at DSM, cogeneration, hydro power proposals and any other that may be economically competitive with the

existing options. Therefore, proposals will be selected on the basis of their own individual merits, regardless of what category they fall under. However, as a first step, and in view of the lack of previous experience, BCH has decided to move cautiously and call for proposals which contemplate a maximum contribution in categories such as export, domestic integrated system and diesel supply areas.

Q. When will an export policy be developed? If export power is worth more than domestic power, what prevents every parallel generator from signing up for export power? Will a wheeling fee be charged depending on the distance from the border?

A. A position on electricity exports is presently being developed by the Provincial Government and BCH, details will be forthcoming in the next few months.

Q. Are existing BCH generating stations or sites open for private redevelopment?

A. BCH is not prepared to dispose of its older plants, so only proposals involving BCH retention of ownership would be examined. Where there are existing control structures without generation, BCH is prepared to discuss possible private construction and ownership of generating facilities. It is likely that individual sites would be put out to tender, so that all interested parties have the opportunity to submit proposals.

Q. How would BCH's purchase price be influenced if it were offered power that could vary from day to day and from season to season?

A. BCH is primarily interested in firm annual energy deliveries. If year to year energy totals were consistent or, at least, predetermined for 10 to 20 years, the price would be unaffected. If no guarantees could be made concerning annual deliveries, the price would drop to that for "secondary" energy, which at present is about 70 percent of the price of firm energy. The foregoing assumes that the local BCH system is capable of handling on and off energy deliveries without unacceptable voltage fluctuations to other customers.

Q. For projects under 5000 kW the purchase price will be between 2.5¢ and 3.0¢/kW·h for 1988 and for future years the purchase price will be indexed to changes in BCH's marginal costs.

How soon is BCH prepared to discuss possible opportunities?

A. In preparation for the Energy Forum BCH developed its "Draft Policy on Purchase of Electricity by B. C. Hydro in Integrated and Non-Integrated Areas" for discussion and feedback. In particular, for purchases from private suppliers with generating capacity less than 5 megawatts (MW), BCH anticipates providing a window in the spring of each year to allow private suppliers to submit proposals.

This window will be in effect commencing in the spring of 1989 and will provide the first opportunity for private suppliers to provide proposals for the sale of electricity to BCH and for BCH to consider and review these proposals.

To ensure that you are kept informed about BCH's future activity, if you have not previously filled out the attached questionnaire, please take a moment of your time to give John Elliott your views. Your response will assure that you will receive our information package on the details of purchase of electricity policy, interconnections and contract principles when it is ready.

There appears to be more interest in private supply of electricity than BCH has either the need for presently or the staff to respond. As a result, we are taking a careful approach on amounts and timing of electricity purchases.

Q. What basis of calculation is used to derive a marginal cost of 1.5¢/kW·h, and how relevant is this? Future marginal cost (3 to 4¢/kW·h in year 2000). Is this based on the construction of new facilities?

A. The marginal cost of 1.5¢/kW·h refers to BCH's short-term marginal cost; it represents the cost to Hydro of additional kilowatt-hours over the next 2 or 3 years. It is only relevant for that time frame, and is not based on the construction of new facilities, which would be more expensive. (That is represented by the long-term marginal cost of about 3 to 4¢/kW·h that you make reference to in your question.) Therefore, the short-term marginal cost would be applied to purchases from private producers only in the next 2 to 3 years.

Q. There may be social factors that also impinge on the economics of cogeneration. Would BCH propose to address these by paying a higher rate for power in certain circumstances?

A. BCH may be asked in certain circumstances to pay a higher price for power to achieve a socially desirable result (e.g. municipal solid waste or wood waste generation). However, we would prefer that those social costs be borne by those who produce them rather than by the rate payers. We are interested in exploring other ways of helping these projects to proceed.

Q. BCH seems to have no idea of the factors that drive investments - including the potential for significant profit. If investors are to be persuaded to sink their money in a power generator they must be convinced that the return they will make is better than they will make in an alternate investment. What is BCH's reaction to this?

A. BCH is in agreement with the statement that from a private investor's standpoint, an investment in power facilities should be competitive with other alternatives. However:

1) BCH, as a regulated utility, has a mandate to meet customers' demands at the lowest possible cost. It is, therefore limited as to how much it can pay to private producers for self-generated electricity (i.e. no more than what it would cost BCH to generate or to purchase that power from other sources, otherwise customers' bills will increase). This may, admittedly, limit a private investor's return.

2) Return on investment is related to risk, among other factors. BCH is proposing long-term contracts (typically 20 years), which offer a private investor a comparatively high degree of security. This may warrant a relatively lower return than alternative investments.

BCH is interested and willing to look at ways to help bridge the gap between public and small private investment perspectives.

Q. Will a bonus be provided for a high load factor or reliability?

A. Yes, load factor and reliability are factors in determining a negotiated price for projects of 5 MW or more. Consideration of these factors will also be given for under 5 MW.

Q. Will the year 1 price be a floor level to provide some financial security?

A. Not necessarily, if the parallel generator selected a financial arrangement such as front-loaded prices, clearly BCH would expect reduced prices in the future. However, ignoring financial arrangements, BCH's marginal costs will continue to increase. Therefore, the price paid to parallel generator's on the grid are expected to increase correspondingly. Off-grid purchase prices are primarily dependent on fuel costs which are volatile. They could decrease, but they are relatively low at present.

Q. How much power is required for 1988/89 contracts?

A. RFP's will be issued in 1988/89 or early 1989/90 for the following:

1. 100 MW to 200 MW on the integrated system for projects of 5 MW or more.
2. 25 MW on the integrated system for projects of less than 5 MW.
3. 400 MW for export.
4. Displacement and/or replacement of diesel generation at Fort Nelson and possibly others.

Q. How fast (or slow) will BCH carry out negotiations?

A. We hope to negotiate contracts in 3 to 5 months after negotiations begin. If negotiations can be completed in less time, so much the better for all concerned, including BCH.

Q. What form of levelized contract is available as an alternative?

A. Normally prices paid to parallel generators would increase as BCH's costs for alternative new generation increase. However, one method of front-loading is to levelize those projected increases over the term of the contract.

Q. How will export power fit into providing wheeling services?

A. Once a policy is established for exports. BCH will negotiate wheeling services with a prospective exporter.

Q. Why limit wheeling services if there is extra capacity?

A. BCH does not want its rate base eroded to the detriment of the remaining ratepayers.

Q. In the power purchase policy for projects under 500 kW, would the price change in relation to the timing of new additions?

A. Yes, the price should increase for later additions because BCH's marginal costs continue to increase.

Q. Will wheeling rates be designed to recover the potential revenue loss to BCH and/or the embedded cost and/or the marginal cost of transmission?

A. They will be designed to cover an appropriate proportion of the embedded (sunk) and marginal (incremental) costs of transmission. The rate would be on a $/kW-km basis.

Q. What form of performance guarantee would be required in order to obtain front-loaded prices?

A. Examples of performance guarantees that may be adopted include an irrevocable letter of credit, insurance, second lien and/or performance bond.

Q. How will the form of performance guarantee be related to the degree of front-loading?

A. BCH must protect itself from undue risk. Therefore, the performance guarantee must reflect the risk of non-performance and the amount of financial exposure. However, the form of the performance guarantee should not affect the amount of front-loading.

Q. With whom will a parallel generator negotiate for power export contracts?

A. With the B. C. Government's export agency.

Q. What is the relationship between BCH's call for 400 MW of export power and the mandate of the export agency?

A. BCH has experience in the export market and the export agency would be making use of that experience.

Q. How is the term "efficient" defined when you state that BCH's goal is to be an efficient supplier of electricity?

A. BCH's goal is to provide high quality, reliable service at the lowest cost.

Q. Are existing BCH generation plant sites open for private redevelopment?

A. Generally the answer is no. However, there may be exceptions related to our existing sites, for example diversions that could increase energy.

Q. Is Creston in the B. C. Hydro service area?

A. No.

PANEL DISCUSSION: RESOURCE PLANNING AND FORECASTING

(EDITED TRANSCRIPTION)

PANELISTS: DON MCFARLANE, B. C. Hydro
JOHN ALLAN, Energy, Mines & Petroleum Resources
DICK GATHERCOLE, B. C. Public Interest Advocacy Centre
KEN PETERSON, B. C. Hydro

RESOURCE PLANNING AND FORECASTING PANEL DISCUSSION

10 JUNE 1988

Panelists: Don McFarlane - Chairman
John Allen, Dick Gathercole, Ken Peterson

Don McFarlane

I thought I would say a few words in historical perspective. I am not at the position to look forward now, because I have retired, but I think I can have the privilege of looking backwards. It is interesting to look back at the history of the power industry throughout North America and the world. In the 1950s and 1960s there was a period of real growth. You could not build enough generation to serve the load. Everything was growing and it was a wonderful time for those people in the utility business because every time they added a plant it came on line at a lower cost. Bigger plants came in at even lower costs and rates continued to go down. The regulatory people made sure of that. However, as the industry grew beyond that period there was a time when plants were much more difficult to construct; the nuclear industry came into vogue, and the cost of oil and gas started to increase. With that the price of electricity generation started to go up dramatically.

The regulatory people started to ask questions. Was this effective management? They started to be very tight on expenses going into rate bases. That made utilities very, very concerned about building anything. On top of that, another regulatory group from the United States, the Federal Agency, brought in PURPA. California is a good example of opening the door to a price based on what you see today and not looking far enough into the future to see what the market conditions might do.

So things changed dramatically in the industry and many of the utilities, particularly in the United States, are seeing the need to get out of resource developments. The nice things that they were able to do in the early days are no longer there. So resource planning and forecasting is becoming a very, very uncertain situation in many of the areas of utility development. B. C. and much of Canada has been fortunate in being protected from some of this. The prices for energy in the Northwestern states and B. C. in particular have stayed pretty low; we have not been faced with those large increases that many of the areas in the United States, such as New York City and California, experienced.

Unfortunately, this makes it much more difficult to see the entrepreneur come along and construct generation to economically compete against the low cost that is already there. If you look back at the early 1960s you will see that we had load growth as high as 15% -- very high growth and very wide swings in growth. Into the 1970s and 1980s that annual growth rate dropped. In fact, one year we had a negative growth. In the 1960s the size of our system was about 1/8th of what it is today, so a 15% load growth in energy at that time is probably only representative of a 2% - 3% load growth today. We are much more capable of absorbing a major pulp mill and not seeing a major impact on the percentage growth in the energy predicted.

So it is interesting to see the dramatic swings in growth and the need to plan carefully. I do not know whether I will ever believe in forecasting in the future, based on my experiences with it in the past.

Now I would like to ask each of the panelists to make a few comments from their perspective and then I will open the panel discussion to the floor.

John Allen

I am just going to go over a wide range of issues very briefly and I would be happy to answer your questions when the other panelists have had a chance to speak.

Looking at Ken's first graph yesterday, with the wide band of forecasts we have had over the last 15 years or so, I was reminded of a TV program I was watching the night before. It was about General Douglas MacArthur and his famous retirement speech before congress when he said, "Old soldiers never die they just fade away". I think you could say the same thing about old forecasts, they never die they just fade away. They are there all the time to remind you of the lessons of the past, and I think that is important to keep in mind. We made mistakes. Sometimes we have been pretty close to the mark. Sometimes we have been far off. However, those forecasts are based on assumptions and educated guesses of the future. We have to recognize that nothing occurs with 100% certainty. This new approach of having a variety of sources is really commendable because it should result in a narrowing of that forecast error and ultimately less cost to the consumer.

We should keep in mind that we have only started a process. As someone reminded me a few minutes ago, we started a similar process in natural gas in October 1986 with the signing of the so-called 'Hallowe'en Agreement'. At that time we did not have all the answers to gas deregulation. We did not even know all the questions. However, we did set out a framework in which there was a broad agreement among the three western provinces and the Federal Government that gas deregulation would be implemented in Canada. While we are not espousing electricity deregulation today, the headline in the Province did say "Greater Role For The Private Sector" and you have heard the Minister's remarks more or less along the same line - emphasizing the greater role for the private sector, but an important and even growing role in some areas for B. C. Hydro.

So we are going to have more and more private sector participation in electricity supply. The private sector will have more and more of a say about our electricity future. In that context, while we do not have a replica of the Hallowe'en Agreement, a couple of days ago there was an amendment introduced into the House whereby the Utilities Commission Act was amended in two particularly significant ways. That amendment would provide the Utilities Commission in this province with greater power over the regulation of wheeling by public utilities. An equally important amendment would give the Commission the power to review energy supply contracts for both gas and electricity. In other words, these contracts that utilities, pulp mills or private sector buyers will be signing will require review by the Commission to see if they are acting in the public interest. That is important because the rate payer is ultimately coincident with the public interest.

Considering the things we have done in gas in the last two years I am encouraged that the same kind of progress can be made in electricity. We have gone into direct sales, we have handled the bypass issue, we have got transportation rates on the transmission and distribution systems, and we will be setting out a core market policy probably within the next week or two with respect to the ability of the so called core market - residential, commercial, small industrial. We will be setting out a policy on the rules of the game with respect to buying direct gas.

So in summary, I am very pleased with what I have heard in the last two days. Simultaneously, with the conference B. C. Hydro has expressed interest in power purchase through Mr. Bell's remarks yesterday morning -- a request for proposals. The government has moved forward with some legislation in support of its policy initiatives and its support of these practices which Hydro is pursuing.

Dick Gathercole

When I first saw that I was going to be part of this panel I thought this is Don McFarlane's way of getting back at me. I used to, in the B. C. Hydro rate hearings, be one of the people who was cross-examining him about his system plan and also cross-examining the forecasters about how terrible the forecasts were. I was afraid I was put on this panel where people from B. C. Hydro would ask me questions about my views on the future forecast for energy need in the province and how I would develop a resource plan. Well, I will consider any questions along those lines to be planted questions and will not answer them. No, I can appreciate the difficulties of forecasting and we must develop an ongoing resource plan. B. C. Hydro must do that and look at various sources so that we avoid the jaws of uncertainty. We will always have those problems, so whatever we can do to make the system more stable in the long run is advantageous.

With respect to the resource plan, as I indicated this morning, much of the approach that B. C. Hydro is now taking is the approach that we were arguing a number of years ago and as recently as 1986. So, I am heartened to that extent, but I still do not think that B. C. Hydro is going far enough in terms of demand side management, coordination and parallel generation in its 20 year plan.

It used to be the only source that B. C. Hydro really considered for a lot of reasons was mainstation generation. They have now taken the next, and I think very important, step in looking at demand side management, parallel generation and coordination as a means of postponing mainstation generating facilities. I would like B. C. Hydro to move that next step and look on these potential resources as replacing the Site Cs and Stikine-Iskuts. Having heard Amory Lovins yesterday, we realize that it is not going to be easy, but there are a lot of alternatives out there.

My concern in looking at these potential resources for only postponing major projects is that this will impact on how far B. C. Hydro goes in pursuing these areas. I guess my hope is that someday I will pick up the B. C. Hydro 20 year System Resource Plan and not see those two little words 'Site C' anywhere in it.

Now the second thing, I am totally supportive of everything that has been done and is going to be done in demand side management. Parallel generation or private generation has some real potential. However, as someone who was here for the preceding panel on parallel generation, I realize there are a lot of problems that must be worked out. The purpose of using these resources is to provide lesser cost energy to B. C. Hydro. It is not, nor should it be, a means of encouraging the development of a private electrical industry, simply because some people think that it might be a good idea. John said he was heartened by what happened in natural gas. I am not so heartened because the people that I represent, residential customers and, to a lesser extent small commercial customers, are the ones that see no benefit from that.

Now were told that the residential and commercial customers are going to benefit from this process eventually and I am looking forward to see what happens. So far the industrial customers have benefited significantly and a lot of the revenue requirement of, for example, Inland Natural Gas, has been shifted to the residential and small commercial customer. Their rates are going up and I anticipate more of that in the future. The same thing is happening in the telephone industry and I was particularly concerned when I heard the Minister at lunch discuss the issue of wheeling. Even though he said it was going to be limited to a new load, I am very concerned about the possibility of Hydro getting itself into the position of having to compete with the private generators for a new load and maybe even existing load.

If that happens there may come a time when the private generators and my clients become allies, because it is my experience, whenever you bring competition into a monopoly environment some customers, mainly the major users, get the benefit of competition and others, mainly the captive small users, are the ones that take the brunt of it. The temptation for the utility is to use its monopoly customers to help it undercut the competition and use them to subsidize that competition.

The two other brief comments I would make, I would want to be sure that we get to the point where we do not have to build these major facilities before we start talking about long term firm export contracts to the United States or anywhere else. Let us look after our own interests first and worry about them second.

The only other comment I would make is this; I think this whole Forum process has been very, very useful. One of the concerns that I have had over the years is the need for public involvement in B. C. Hydro's planning process. Until now the only alternative was hearings before the B. C. Utilities Commission. While those are fun, interesting and I quite enjoy them even when they go on for a long time, that was where we put all our resources. When we have this type of process where Hydro circulates its Resource Plan, asks for comments on it, has a Forum like this which then it will use in its planning process, that is very positive and it means that the regulatory hearings can be focused on the issues that are brought before them, whether it is a rate increase or something else.

I would encourage Hydro to develop this process and ensure, by whatever means it can, that the involvement is as broad as possible, that they encourage people, including members of the environmental movement and people like my clients to participate more fully in this type of process in the years to come. I think B. C. Hydro and the Ministry are to be commended for sponsoring this Forum and I am looking forward very much to participating in the ongoing process and someday seeing a Resource Plan without Site C or Stikine-Iskut.

Ken Peterson

I think starting on Monday we will rename Site C the Dick Gathercole Generating Facility. I cannot leave the previous panel on parallel generation alone without one remark now that I have an opportunity. After having done a deal with Queen Charlotte Power Company and Clyde Coats, all I can say is 'After hearing all the stuff about the little guy I hope that the negotiating skills are not proportional to the megawatt size of the facility, because if Clyde at 6 MW can do as good a job as he did I would hate to see the big guy that is coming in with 900 MW'.

Another point about all that confusing stuff on the actual costs of Site C and so on. I think it is fair to say that, if a developer came in with a 70 year plant that he wanted amortized over 20 years, the way that our financial costs would be put into the books and wanted to make a deal on that basis and then on day one of the 21st year said he said here is your plant then we would look at that. However, on that 21st year that is when that plant starts to produce extremely low cost energy. If we go back, Don reminded us a little bit about the planning and forecasting in the past, when it seemed like there was more certainty because we could not do anything wrong as long as we were building quickly given the load growth that we had.

In fact, we had what you might call a two perimeter planning process. We had our annual forecast of load growth in one hand and then we had the unit cost of various resource options on the other. It was a relatively simple matter to match them up and stack them. The biggest problem was how to get out there and build them fast enough. However, certainty is an illusion -- that is a quote from somewhere though I cannot give you the author of it. Even in that time, there was a lot of uncertainty, but we did not recognize it. Now that we are recognizing it, facing many more options and many more alternative outcomes for load growth, it is actually a much more exciting time to be in the forecasting and planning area and I am proud to say that we have some very good people working on that problem right now in B. C. Hydro.

Just a final point about load growth and the opportunities for demand side management. We tend to take a bit of a contrary view -- we have already experienced this year the same growth that we were forecasting just last summer for the end of the fiscal year. In other words, we are about where we thought we would be in March of 1989. This growth is coming from a couple of sources, not only the activity in the forest industry, but people have the confounding habit of using more electricity in more ways than we can predict. For years we had declining average use per account in our residential sector because our technical people were telling us that that is what was going to happen. Every year we would say well next year it will turn down. Well, it has flattened and in fact it seems to be turning up. The same is true in commercial accounts. That may be, as some will say, just another challenge for our demand side management people, but because the load is growing the annual increment will ultimately lead to the Dick Gathercole Generating Plant at some time unless we are much more successful in some of these other programs.

Don McFarlane

Now you have heard some of the words from the panel and I am not going to give them a chance to rebutt any of the words of the others, and I would like to open it to questions from the floor.

Martin Sherriff, Phillips Barrett Kaiser

Some two or three years ago, Ken, I was reading an article from an European magazine that postulated something that I would like to ask you about. In a technically developed society the demand for electricity per capita actually approaches an S curve that in the early stages of technical development, when you are building sheltered housing with some heating and cooking and so on, the demand rises fairly rapidly. Eventually you reach a limit as to the amount of electricity that one human being, living in a technical society, can actually consume because you cannot be in two elevators at once and you cannot use more than three cooking pots on any one electric heater at any one time. Therefore, at some point the demand flattens.

Listening to some of the speakers yesterday, I am now of the opinion that in an even more technically advanced society that the demand drops per capita. Can you perhaps explain how you anticipate the growth of electrical consumption per capita might change? In other words, what will be the approximate position at the end of your present 20 year forecast?

Ken Peterson

On what you might call the non-interventionist model we have a lot of the programs where we are trying to get people to use less electricity on the resource side. If you look just at the trend on the demand side where we do not have those programs reflected, we do see some decline in average use, but it is rather gentle over time, largely because there seems to be more creativity and innovation in putting electricity to new uses in appliances than there is in reducing consumption.

Cyrus Noë, Editor, News Data Corporation, Seattle

This question is addressed to the panel generally, we will see who would like to take a crack at it first. At a time when we are faced with increasing demand side management, conservation, cogeneration and things of that sort, what does the panel think the real cost or price of energy is going to be over the next decade? Will it go down, flat or up?

Ken Peterson

We feel confident in British Columbia being able to predict that the real price of electricity will decline or hold steady at today's rates. In other words, we should see rate level increases at or below the rate of inflation.

John Allen

You mentioned the word energy, I could just add to that that I would agree with Ken on the electricity side. On the oil side I would say prices would be pretty flat for the next few years and then maybe escalate in real terms, maybe slightly above the rate of inflation toward the end of your ten year period. I see gas increasing slightly in excess of that in a few more years. A lot of the gas price, of course, will be driven by the conditions in the export market, the so-called U.S. gas bubble, needle sausage, or whatever you call it. When that might expire in the next few years export demand will tighten up and I would expect to see gas prices start to accelerate a little more rapidly than any of the other energy forms. However, we are starting from a pretty low base in this province and I would say that the energy price future looks pretty healthy overall.

Don McFarlane

I presume Dick that you are pleased with those statements and have no comment?

Dick Gathercole

No, I was going to say they are the experts, so I would like to agree with them and I think maybe in the short run that is true. My only concern would be, if we cannot get as much as we would hope from the demand side and other options, or if we get ourselves locked into unfavorable long term export contracts, that we may be forced to bring on the major Hydro projects, for example, the Stikine-Iskut. I have some real concerns about the costs then. I would hope that my friends on either side of me are correct.

Jim McDonald, East Kootenay, McDonald Ranch and Lumber

Yesterday one of the speakers mentioned something about the downstream benefits of the Columbia River Treaty which B. C. Hydro is supposed to get in 1998 or whenever. Are not most of these benefits from the Columbia River Treaty already being used by Bonneville Power and the other users in United States. In what form will B. C. Hydro get those back when the agreement terminates?

Ken Peterson

Well, I can make some comment and maybe one of the other panel members may wish to. The Columbia River Treaty states exactly what downstream benefits are and the calculation methods to determine them. The first years of these benefits were sold to a group in the Northwest and once that contract is over they will be recalculated according to the Columbia River Treaty; they become part of B. C.'s energy picture and they will be returned to B. C. They are fully committed within the Treaty; there is nothing in place to permit them to be held back by the Northwest utilities.

Jim McDonald

In other words, we will be getting power back from the benefits of the Columbia River Treaty.

Ken Peterson

That is correct, we will be getting substantial benefits back. In fact, it is in the order of a Richard Gathercole Generating Plant.

Conrad Guelke, B. C. Hydro

One of the questions that seems to be pushed into the future, given general agreement about the three Cs, is "When you have used up that part of the "Three C" resource that is economical, what do you do next?" This question is for Dick Gathercole. We are very aware of what you consider unacceptable and it would seem that Site C and the next of the group of traditional Hydro projects are unacceptable to you. I do not know where Murphy-Keenleyside fits because these are the completion of the two rivers projects. Environmentally, when you go beyond those two projects you are into new river basins that open up new environmental challenges. Do you oppose Site C as part of general opposition to hydroelectric projects? Do you consider that there are other traditional generation resources like thermal resources based on coal that would be more acceptable to you?

Dick Gathercole

The position I put forward on behalf of my clients is shared by a lot of other groups in terms of priorities. I see these priorities as being the most economic, but the least environmentally unacceptable. It is not a question of saying, "Let everybody freeze in the dark before we build Site C". It is a situation of taking an approach and saying, "This is what we want to do first". As I said in my earlier remarks, "I am very pleased to see Hydro moving in a direction". It has moved away from a position where -- I think it is fair to say -- Hydro's position was, all things being equal, that we would prefer to build Site C. What I would like, all things being equal, is for Hydro to say, "We prefer not to build Site C" and even, "We will do everything we can to avoid having to build Site C".

In the present situation and with the direction B. C. Hydro is going, we have a number of years for all of us to look at all of the alternatives that might be developed and the new technologies that might come forward -- some of the things that Amory Lovins was talking about. I am not being facetious when I say that I hope we can move in that direction, and I think it benefits everybody. I think one of the things that I mentioned about keeping the power at home as much as possible is it is inexpensive and efficient power and can be used to develop industry in British Columbia. That is what I think ought to happen. I do not think we should be exporting cheap energy to allow California, Washington and Oregon to develop those industries and then sell us the products. I prefer to do that here, so that is probably a long answer to a fairly short question, but that is the direction in which I hope B. C. Hydro would go. We may get to the stage where, 10 years down the line, we do not really have to think about Site C as an alternative.

Don McFarlane

I think Dick's point is that B. C. Hydro should look at other alternatives in the future whatever they may be.

Dick Gathercole

Well no, I think in fairness Don, I was asked what I consider to be acceptable alternatives and I said I had laid out this morning the priorities that I thought should be examined. If all those priorities are looked at and assessed, and we have run out of them and we still need energy then we move onto what I put at the end, the major generation projects. Let us see where we get before we see whether we have to deal with that.

Ken Peterson

I think that the plan that we have now carries us comfortably through until the end of the 1990s, assuming that the growth is more or less as we see it today. However, we really do not have a firm view about resources for development beyond the year 2000 and maybe that would be an interesting topic for next year's Forum. Then we will know more about the progress that we have made on demand side management and so on over the coming year. Then we could try to address those questions. What is acceptable? What is appropriate for resource development beyond that time frame? Large scale projects that we have in our plan now, like Site C and Hat Creek, have up to a 10 year lead time. We must start thinking about them very soon to get them in service for early in the next century.

Mark Jaccard, Professor, Simon Fraser University

Having John Allen sitting there as someone representing the Ministry makes you a bit of a sitting duck. The Minister gave his talk and left, so we did not get a chance to ask him any questions. I know that you are in a difficult situation as a public servant, but nonetheless I will direct a couple of questions at you that I wanted to direct at the Minister. I think that they apply to a couple of themes that have come through the discussion over the last two days.

One of them is this whole notion of standards. We looked at other jurisdictions that are trying to do this in some way or another. We asked B. C. Hydro and their response was "Well, that is a political question and we have not pushed for that". Is the Ministry looking at standards for appliances, buildings and so on?

We have been looking at conservation of electricity and obviously there are other energy forms to be considered. I am wondering how the private sector's interest in conservation of other energy forms is being stimulated by the government? For example, has conservation or parallel generation been considered as an alternative to a natural gas pipeline to Vancouver Island?

John Allen

While Mark has admitted to putting me in the hot-seat I should share something with the audience. He sent me a letter recently asking me for some advice on topics for his students. I have just sent the letter back to him and now he has come back with these questions. What a thank you!

There is a short answer to the first question, is the Ministry looking at standards? The answer is no. We do not do that kind of work. We have not done that kind of work for about five years. The government has taken the approach of trying to let the market work, particularly in the Energy sector. There are standards in place as everybody knows, but we are not promoting or pushing them in any way. Some of them come from the Federal agencies.

With respect to your second question, what other options are there besides the conservation of electricity? Are there other energy forms? We did a little analysis on Vancouver Island. We looked at energy options for the Island including conservation, gas and electricity and came to the conclusion that gas was the best option, in combination with some conservation and some Electric Plus (B. C. Hydro's interruptible electricity program) which Hydro is promoting right now. That program is in place.

Conservation, given our energy prices, has very long paybacks if you go into it in a big, big way, Amory Lovins' presentation notwithstanding. So, that is basically where we are at right now. We are negotiating with Ottawa on a contribution towards the gas pipeline. Again, to repeat, B. C. Hydro is putting the Electric Plus program on Vancouver Island, but as far as conservation is concerned we are trying to get the right energy price signals to the consumers, so that they can make that decision themselves.

Unidentified Speaker

All of these discussions on cost have a bearing on the forecast. Some time ago, the government ordered B. C. Hydro to achieve a certain debt-equity ratio and then rescinded that. Do you know if there is any consideration for future requirements of that plan again?

John Allen

Just to clarify the speaker's point, not to criticize in any way. The directive is to the B. C. Utilities Commission to regulate Hydro in a certain fashion. That fashion was for Hydro to achieve a certain level of interest coverage and a certain target debt-equity ratio. That has not been rescinded, the order is still in place. What was changed a few years ago was the target date for the achievement of that interest coverage ratio. I believe, while Hydro is not showing a particularly robust interest coverage ratio, its revenues are going up and its costs are coming into line.

B. C. Hydro has been trying to hold the line on rate increases and market as much surplus as it could through rate discount programs in B. C. and through the export market in an attempt to keep its revenue base up, not to run losses, and to achieve its ratio in the year 1991 without any major impact on domestic customers. There are a few years left to achieve this ratio and the target date and the size of the ratio that Hydro will have in 1990/91 will be dependent on export revenues, cost control and any rate increases that they might apply for.

Unidentified Speaker

So, the rate of electricity growth could increase?

John Allen

As your load grows you make more money if you are not building plants and incurring extra costs.

Unidentified Speaker

But what I was talking about was the effect of keeping the price of electricity down is an increase in the demand for electricity.

John Allen

No question. As rates decline in real terms you will get a demand response. Managing the trade-off between low rate increases and demand growth will be another hard task for Hydro over the next few years.

Joe Stauder

In order to reduce the debt or get rid of it altogether, has B. C. Hydro considered selling all of the generators, including Revelstoke, the whole thing, to private hands and get rid of the debt altogether, possibly even put some money in the bank and perhaps even reduce the rates.

John Allen

I think that is a very interesting question. That same question was passed on to the administrator of Bonneville Power Authority. His comment was, "Would we sell our crown jewels"? Would we really sell those very valuable resources? I think the generating plants are really the crown jewels of B. C. Hydro.

Ken Peterson

I think the answer, Joe, is no. Although it is a very common practice in private industry to sell assets and lease them back, you get the same use out of them plus you free up capital for other investments. It is certainly not out of the question that something like that might be done by sharing surplus capacity with another utility. These are options that we can review. I am thinking of the capacity of extra units at Revelstoke and Mica.

John Allen

It also comes down to the price you paid for it. Is it the price that you built it for or is it the value of that resource at the moment? I think, in terms of the crown jewels, it is very valuable at the moment.

Don McFarlane

If there are no more questions I am going to ask the panel members for a one or two minute of summing up.

John Allen

It is obvious to me that people who ask questions at these Forums and the people who speak at these Forums really know what they are talking about. It has been nice to sit hear and listen to this exchange without the heated arguments you might see in hearing rooms. There has been a free and frank and open exchange of ideas. I think Hydro received a lot of good feedback. We in the Ministry have as well. I know some of you write letters to us feeling that we just go blindly ahead, ignoring your concerns and comments, but that is not the case. Those of you who have written to us in the past have given us carefully reasoned and well thought out letters; you serve to keep us honest. I think we do a better job in monitoring the public concern than the public thinks we do. Nevertheless, we do welcome your letters so keep those cards and letters coming.

I think Ken touched on a good point and I am hopeful this banner is accurate, that it is the First Forum meaning there will be another one. I would like to see us get into more detailed, nitty gritty issues next year or sooner. By then we should be beyond the broad umbrella-type statements. Our legislation will have been in place. Hopefully, someone will have used it and tested it as in the case of gas. We will be getting some feedback from the market place to see where we have to make adjustments. And again, I would like to repeat we do not look to the future with 100 percent certainty. I know we will have to make adjustments so you will have to bear with us to some degree.

Dick Gathercole

I agree with John it has been a very interesting and informative forum. I certainly learned a lot and look forward to the future one. When looking at demand side management and conservation and talking about sending out proper signals to your customers, one issue that must be addressed is rate design. So long as you have a rate design structure that encourages use, but at the same time you have other mechanisms where you are trying to discourage use, there is a contradiction. I think that may be another subject at the next forum.

Ken Peterson

I would like to observe that, as an economist at least I was able to provide some laughs professionally, if not personally. I would like to reiterate what was mentioned a moment ago about this being an exciting time to be a utility planner. The direction that we have taken in our Resource Plan this year opens up all sorts of exciting avenues and I would be quite happy to see, for example, Site C slip off the end of the 20 year plan if all of these other more cost-effective resources were actually able to do that. Certainly, we are going to find out as we go along. I am committed to the direction that we are going now and look forward to being able to review this next year to see where we have gotten.

Don McFarlane

As moderator I guess I can have the last word for this panel and it is simply this: in the industrial development of North America, energy has been the driving force behind economic growth, particularly electrical energy. When the cost of the other forms of energy went up dramatically, efficiency became prominent in reducing the use of oil and gas. Electrical energy continues to be a driving force in the economy; one of the reasons is its flexibility. It can be used for many types of industrial product development and within the household, it is easy to transport and easy to use. It is not easy to store though and that is the one difficulty with it. In closing, I would like to thank the panel members and I will turn it over now to Bill Best for summing up.

Bill Best

Thank you very much Don, panel members. Things were going along very there until Dick Gathercole spoiled my appetite and probably that of others when he suggested he wanted to get into rate design. What a terrible thing to say on Friday afternoon.

I have one other request as well that I give one minute to Bob Mussetter who I think wants to put in an order for power.

Bob Mussetter

The Energy Commission just published its bi-annual report though it looks like an annual report of a large corporation. It is full of colorful graphs and lots of other information about us. For any of you who would be interested in receiving a copy of it, I am told by our publications people that they will mail one free of charge on request.

CONCLUDING REMARKS

(Edited Transcription)

Bill Best
Vice-President on Special Assignment
B. C. Hydro

Larry Bell
Chairman and Chief Executive Officer
B. C. Hydro

CONCLUDING REMARKS

Bill Best

Thanks very much for that offer Bob. I want to thank all of the speakers who participated in the Forum over the last two days. I want to thank the staff of B. C. Hydro and others from the hotel who did a fine job in keeping everything going smoothly. I want to thank our co-sponsors, the Ministry of Energy, Mines and Petroleum Resources for their support and assistance. Most of all, I want to thank all of you for in the first place, coming, in the second place, being very good listeners and finally, for your very good questions. I do not think there is any doubt on the part of B. C. Hydro and the Ministry that this was a useful Forum and a useful exercise. It will certainly be on our continuing agenda for developing policies within the corporation. But to wind things up I want to ask Larry Bell to make some concluding remarks.

Larry Bell

I promised myself that I would not enter into the debate and I think I did pretty well. I also promised myself that I would not give the concluding remarks. I have broken that promise to myself since I am going to make some comments. Indeed my motivation is sparked by the vigorous debate that went on here and the interaction between the panels and yourselves which led me to want to wrap up and to provide some emphasis to certain topics.

I thought about what I learned. I suppose Ralph was the fellow that put it into perspective. In designing our programs and thinking about our policies we have to come to grips with the issue of discount rates. As an individual, you and I are prepared to make an investment if it is paid back in one year. As a utility we build a dam and we amortize it over what we think is the useful life of the asset, which is obviously a traditional, well-accepted, financial practice, but it equals 70 years. How can we bring these two together in some rational way when we design our programs? That is a real challenge.

The second observation I would make, other than just the kind of fun that we had in having our horizons expanded greatly yesterday with demand side management possibilities, is to consider the energy that flows from demand side management and generation as being identical. Indeed, if we can crack our proposal calls this fall, and I understand there is only one utility in North America that has managed that, we will see parallel generation and demand side management compete against each other. That brings me to my next point. We each have our particular interests, and they flow through in some of our comments and some of the suggestions with respect to policy.

We must always recognize that we are required collectively to serve the economy of this province and our customers. Therefore, we must expose our purchasing and our policies to competitive market forces, so that we provide energy economically and efficiently. We lose sight of that at times, but I just wanted to bring you back to it. We talked about the small producers under 5 MW; we slip into an attitude that begins to have the characteristics of a social program. Well, I tell you it is not a social program. Dick Gathercole made those comments and I agree totally with him. We must be concerned with our transaction costs.
Mr. McDonald is he still here? I was fascinated by his comments. He gets $400 a month in revenue. We talk about that rate Mr. McDonald, but you go in and have chats with my manager. Do you know what he costs me an hour? About $125 an hour. Now that is one chat a month I have to take off your $400 if I am going to pursue a cost-effective method of producing electricity for the customers and the economy of this province. We must remember that there are enormous transaction costs associated with very complex issues. It does not matter whether it is one MW or 20 MW you are still having the conversation with not only my manager, but my head office specialists who cost $200 an hour. So, when they answer the phone that is a $50 bill gone out the window and we must be concerned about that.

In the independent power producing section some of you talked about this competitive price like you should not be exposed to market pressures and competitive pricing. You bet you should be. There were some comments here "Oh well, if it is Site C we will never make it". Well, first of all, you will. What I am worried about is dealing with ten times as many proposals this fall as we can possibly handle. All of you have transaction costs in submitting to us. It will probably cost you thousands of dollars to make some of these proposals to us, and maybe we will only be able to take 10 percent of your proposed energy deliveries and the rest of you will have to absorb those costs and come back another year. That is my worry. It is not that you cannot compete. Our experience, with the pulp mill that I mentioned in my opening remarks, clearly indicates that. The company said as soon as we get this deal we have four more. Those four projects probably represent at least what we are prepared to purchase from our Request for Proposals this fall. We may even get double that from other pulp mills with potential. So it is going to happen.

There was some talk about a level playing field. It was said that Site C at 3½ cents is unfair and so on. It is not a game of fairness. It is a game of market competition. You compete and you are the low cost option. We will do our analyses correctly and professionally. Believe me, we will try our best and we want your criticism, but it is not fairness, it is accuracy that we require.

I would also like to make a comment with respect to the three Cs. You must remember that B. C. Hydro always has the obligation to serve. In that context, looking out 10 years we can only serve two of the three business possibilities. We can have too much power, we can have just enough, but we cannot have not enough. Therefore, when we talk about being out by one year, two years or three years in terms of looking into the future, it is within this context. As a businessman with a monopoly and an inelastic demand for electricity I would love to consider the other possibility. We would make an enormous amount of money in a few years by moving the prices up because we would be able to design our supply, our resource plan, to have insufficient supply. That is not in the public interest and it is not our responsibility.

Today and yesterday I was very gratified by the kind of interest and excitement over the business opportunities that flow from the programs that we are discussing. One of them we will examine. Why are we not manufacturing or assembling those energy efficient light bulbs? There may be other opportunities and we would like to look to you to come and talk to us about some of those opportunities that you have identified over the last two days. I was delighted in the last hour to have been put in a position where we do not have to consider what we are going to name our next project. If you think all of this policy debate is tough - it is tougher naming these projects where everybody has their own point of view! But that has been settled by Dick and I thank you for your input.

Well, I thank all of you for your input. Please fill in the evaluation forms. Tell us how you think we should do it next year and tell us what you think would be an appropriate topic for next year.

We hope to put the policies in place by October 1st. So we look for you and others to provide us with your comments and your suggestions. I have not checked with him yet, but the fellow to direct them to is Mr. Chris Boatman, our Vice-President of Corporate Affairs. We hope to get a lot of mail because we genuinely are interested in your comments.

I would like thank our out-of-town speakers for sharing their views with us. Thank you very much ladies and gentlemen, we will see you next year.

HANDOUTS

THE SPEAKERS AND PANELISTS

LARRY BELL
B. C. Hydro

Larry Bell is the Chairman and Chief Executive Officer of B. C. Hydro and Power Authority. Mr. Bell draws on an extensive background in both the financial and public sector. Prior to his appointment to B. C. Hydro, Larry Bell spent three years as C.E.O. of Vancouver City Savings Credit Union. In addition, Mr. Bell has served as the provincial Deputy Minister of Finance and the Deputy Minister of Lands, Parks, and Housing. Mr. Bell holds a B.A. degree in Economics and Geography from the University of B.C. and received a M.A. in Social Science from San Jose State College, California in 1963. He is currently a Board member of Montreal's Institute of Research on Public Policy and is also the Vice-Chairman of the Vancouver Board of Trade.

BILL BEST
B. C. Hydro

Bill Best is currently Vice-President on Special Assignment at B. C. Hydro. Mr. Best joined the former B. C. Power Commission in 1958 as an Engineer-In-Training and has held many senior executive positions with B. C. Hydro since 1975 including the Vice-Presidencies of Corporate Planning, Business Operations, Systems Development and Research, Marketing and System Planning, and Customer Service. Mr. Best has a thorough knowledge of the electrical energy business from the construction and maintenance of electrical distribution systems, to marketing, forecasting and planning. He graduated from the University of B.C. with a degree in Electrical Engineering in 1958 and is a member of the Association of Professional Engineers of B.C. Mr. Best is currently a member of the Board and the Executive Committee of the Canadian Electrical Association.

KEN PETERSON
B. C. Hydro

Ken Peterson has been with B. C. Hydro since 1977 and is presently the Manager for Policy and Planning. His responsibilities as head of this department include rate design and administration, load forecasting, resource planning and policy analysis. Mr. Peterson has extensive experience in economic evaluation and policy analysis of major issues such as long term electricity export, flexible supply planning, and discount electricity rates to promote investment and employment. He received his M.A. in Economics at Northwestern University following a B.A. in Economics from U.B.C. He has also worked with the Westwater Research Centre at U.B.C.

TIM NEWTON
B. C. Hydro

Tim Newton is currently the Manager of Marketing Programs Development and has held a number of different positions at B. C. Hydro in the fields of energy management, engineering, planning and computer applications. He is also the current Chairman of the Canadian Section of the Columbia River Treaty Operating Committee, an international committee responsible for operating facilities on the Columbia River to produce optimal benefits for both Canada and the United States. Mr. Newton is a Rhodes Scholar who joined B. C. Hydro as an Engineer-In-Training in 1967 after graduating from Oxford with honours in Engineering and Economics.

JOHN SHEEHAN
B. C. Hydro

John Sheehan was recently appointed as the Vice-President of Customer Services and has previously held the position of Vice-President of Finance at B. C. Hydro. Mr. Sheehan has an extensive knowledge of public and private sector finance having held senior executive positions at Petrosar Ltd., Air Canada, Chromium Mining and Smelting Ltd., and George Weston Ltd. He is a Chartered Accountant and a graduate of University College in Cork, Ireland where he obtained a degree in Commerce. Mr. Sheehan has held many senior positions in the Financial Executives International organization.

SUE HICKEY
Bonneville Power Administration

Ms Hickey is presently the Deputy Assistant Power Manager for Marketing at the Bonneville Power Administration (BPA) in Portland, Oregon. She joined BPA as a staff assistant to the Conservation Manager in 1982 and was soon selected for the position of Divisional Director of Conservation Planning and Evaluation. She has also served as the Acting Assistant Administrator for Conservation and Power Resources. In addition, Ms Hickey has held senior positions at Western SUN (a solar energy contractor) and at the United States Department of Energy as an Environmental Specialist. Ms. Hickey has a M.Sc. in Environmental Engineering from the University of Florida.

RALPH CAVANAGH
Natural Resources Defense Council

Ralph Cavanagh is a Senior Staff Attorney and Northwest Energy Project Director for the Natural Resources Defense Council (NRDC) in San Francisco. Founded in 1970, the NRDC is a national environmental organization and Mr. Cavanagh is considered a leading spokesman for the environmentalist position on energy issues in the U.S. Pacific Northwest. Mr. Cavanagh received his graduate degree in law at Yale University in 1977. He spent two years with the United States Department of Justice before joining the NRDC in 1979. He has taught energy law at both Harvard and Stanford Law Schools and is a member of the Energy Engineering Board of the National Academy of Sciences.

JACK HABART
B. C. Hydro

Jack Habart is Planning Supervisor of Residential and Commercial Energy Management at B. C. Hydro. He has been involved in program planning and evaluation since the Marketing group was formed in 1984. Mr. Habart has been involved in developing the Demand Side Management strategy at B. C. Hydro as well as the development of individual DSM programs. Mr. Habart received a M.B.A. from Simon Fraser University in 1979.

ZAK EL-RAMLY
B. C. Hydro

Zak El-Ramly is the Supervisor of Residential and Commercial Energy Management at B. C. Hydro. Mr. El-Ramly has been responsible for the development of the overall DSM strategy at B. C. Hydro along with the development of the proposed residential and commercial DSM programs. Dr. El-Ramly worked in the oil industry in Kuwait after obtaining his Bachelor's degree in Mechanical Engineering in Cairo. He joined B. C. Hydro in 1977 after receiving his Master's and PH.D degrees in Aeronautical Engineering at Carleton University in Ottawa.

DEREK HENRIQUES
B. C. Hydro

Derek Henriques is the Supervisor of the Industrial Energy Management Section of the B. C. Hydro Marketing Services Division. Mr. Henriques' experience in the field covers electrical system design and electrical maintenance for both industrial and utility systems. Mr. Henriques is a Registered Professional Engineer in the Province of British Columbia and holds a Master's degree in Power Systems Analysis and Control.

AMORY LOVINS
Rocky Mountain Institute

Amory Lovins is a consulting experimental physicist and has been named by Newsweek as "one of the Western world's most influential energy thinkers". Educated at Harvard and Oxford, he has received an Oxford M.A. by Special Resolution, five honorary doctorates and has held a variety of academic chairs. He has published a dozen books and over a hundred papers on strategic energy planning. Mr. Lovins is widely consulted by electric utilities, governments, public interest groups and private sector clients. He is currently Director of Research at the Rocky Mountain Institute in Colorado, a non-profit educational and research foundation which fosters the efficient and sustainable use of resources.

JOHN ELLIOT
B.C. Hydro

John Elliot is the Manager of the Export & Interutility Marketing Department at B. C. Hydro. One of Mr. Elliot's responsibilities is the purchase of electricity from private suppliers in B. C. Hydro's integrated and remote (diesel) systems. Mr. Elliot has been involved in the policy development for the integrated and non-integrated purchase of electricity, wheeling of electricity and integration of remote communities. He has also been involved with export sales to Washington Water Power, Puget Sound Power and Bonneville Power as well as interutility sales and purchases. Mr. Elliot has also participated in the development of B. C. Hydro strategies on electricity exports and the Free Trade Agreement. He is a Registered Professional Engineer in the Province of B. C.

BRUCE PRIOR
B. C. Hydro

Bruce Prior is Assistant Manager of the System Planning Division at B. C. Hydro. Mr. Prior has many years of experience in the strategic, technical and economic planning of bulk electric transmission systems. He is a Registered Professional Engineer in the Province of British Columbia and was past Chairman of the Vancouver section of the IEEE. Mr. Prior holds a M.A. Sc. in Electrical Engineering obtained at the University of British Columbia in 1971.

CLYDE COATS
The Coats Group

Mr. Coats is an entrepreneur who recently finished constructing a private 150 KW generating station. This successful project is located in the Gulf Islands and started feeding into the B. C. Hydro grid in January 1988. As a Director of Queen Charlotte Power Corporation, he represented that company in negotiations to supply power to B. C. Hydro at Sandspit from a proposed 6 MW generating station. Mr. Coats' other business endeavours include active involvement in forestry and land development.

ARIE VAN DONKELAAR
Cariboo Pulp and Paper Company

Arie van Donkelaar is the Assistant Technical Superintendent and Energy Coordinator for the Cariboo Pulp and Paper Company in Quesnel, B. C. He has been engaged in planning and operating a cogeneration system that provides for most of the company's energy needs. Mr. van Donkelaar joined the paper industry in 1958 in Ocean Falls, B. C. and has since worked in Crofton, B.C., Samoa, California, and Woodland, Maine. Mr. van Donkelaar graduated from the Tropical Agricultural College, in Deventer, Holland in 1953.

DICK GATHERCOLE
B. C. Public Interest Advocacy Centre

Dick Gathercole has been the Executive Director and General Counsel of the B. C. Public Interest Advocacy Centre in Vancouver since 1981. On several occasions he has represented consumer and environmental groups in energy matters before the B. C. Utilities Commission. Mr. Gathercole received his degree in law from the University of Toronto in 1965 and his LLM from the University of London in 1968. Mr. Gathercole was previously an Associated Professor and Director of the Clinic Program in the Faculty of Law at the University of Toronto.

BOB MUSSETTER
California Energy Commission

In 1986, Bob Mussetter was appointed by the Governor of California to serve a five year term as Commissioner on the California Energy Commission. Mr. Mussetter has been involved in power plant siting, electricity forecasting, building and appliance efficiency standards, related technology development and contingency planning. Mr. Mussetter has been a self-employed real estate broker and appraiser in the Sacramento Valley for over 22 years, and twice he was the Mayor of Williams City. Mr. Mussetter holds a Bachelor's degree in Economics from the University of California, Berkeley.

HEDLEY PALMER
Ontario Hydro

Hedley Palmer is currently the Director of the Energy Services and Development Division of Ontario Hydro. Mr. Palmer is responsible for all activities related to the supply of electricity from parallel generators, including negotiations, contracts, rates and related policies. He is also responsible for research and development activities related to demand management. These responsibilities include research into customer needs and attitudes towards electric service, strategic planning, test marketing, technological development and staff training.

JACK DAVIS
Minister of Energy, Mines and Petroleum Resources

The Honourable Jack Davis is an engineer, economist, former M.P. and currently a Minister in the B. C. Cabinet. Federally he has served as Minister of Energy, Mines and Resources, Minister of Fisheries and Minister of the Environment. Provincially, he has been Minister of Transportation and Communications as well as Minister of Energy before being appointed to his present position. Chosen as Canada's Engineer of the Year in 1975, Mr. Davis is also a Rhodes Scholar and the author of several books.

ED MACGREGOR
Energy, Mines and Petroleum Resources

Ed Macgregor is Assistant Deputy Minister of the Energy Resources Division of the B. C. Ministry of Energy, Mines and Petroleum Resources. In this capacity, Mr. Macgregor is responsible for the planning and implementation of B. C.'s energy policies and programs. Mr. Macgregor was Assistant Deputy Minister of the Mineral Resources Division from 1977 to 1980. Prior to 1977, Mr. Macgregor was Director of Projects for the BC-NKK Steel Study and Chairman of the Provincial Coal Task Force. He holds a M.A.Sc. degree in Metallurgical Engineering from the University of British Columbia.

CHRIS BOATMAN
B. C. Hydro

Chris Boatman is presently the Vice-President of Corporate Affairs and Executive Assistant to the Chairman of B. C. Hydro. In 1984, Mr. Boatman was appointed Manager of B. C. Hydro International Ltd., a subsidiary company of B. C. Hydro involved in offshore consulting services. He was involved in research projects and hydro-electric projects in the People's Republic of China and sat on the Board of CIPM Jangtze Joint Venture, a consortium of Canadian consulting companies involved in the Yangtze River Development. In 1986, Mr. Boatman joined the Office of the Chairman and C.E.O. as Executive Assistant to the Chairman and President. Mr. Boatman graduated from the University of London in 1963 with a degree in Civil and Structural Engineering.

DON MCFARLANE
B. C. Hydro

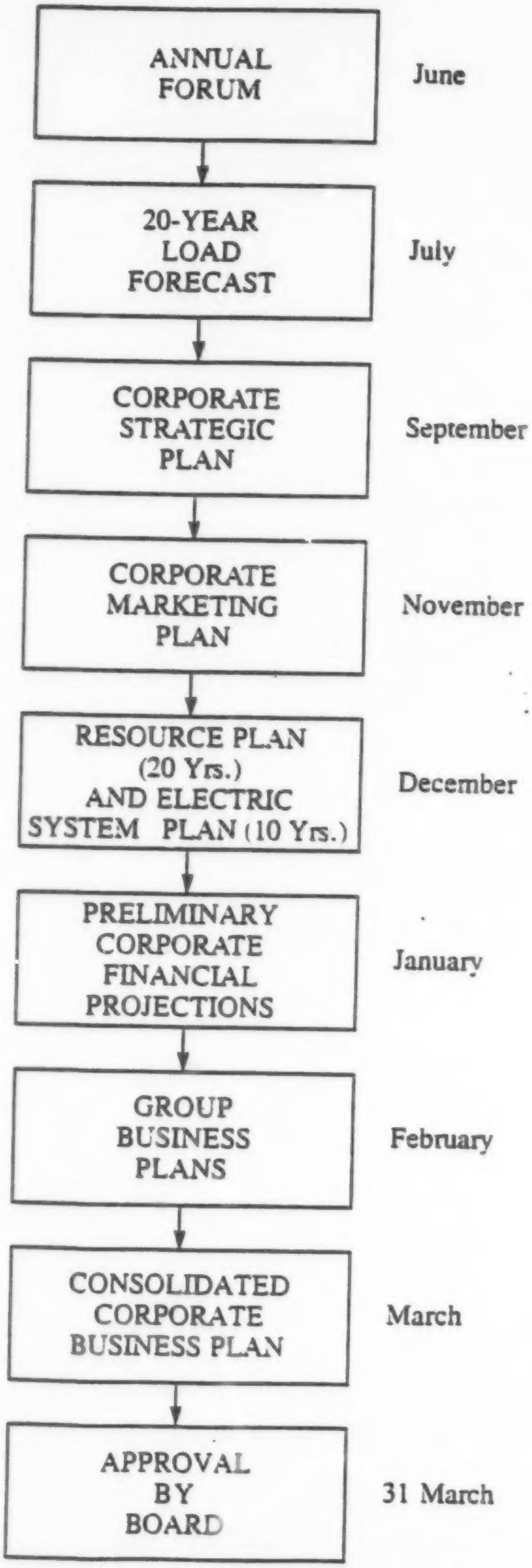
Don McFarlane recently retired as Manager of System Engineering at B. C. Hydro. In this position he was responsible for planning generation, transmission and substation additions to the electric power system. Since 1957 he has worked in the electric utility field with B. C. Electric Co., International Power and Engineering Consultants, and B. C. Hydro. Mr. McFarlane is a Registered Professional Engineer in the Province of British Columbia and a senior member of the Institute of Electrical and Electronic Engineers (IEEE). Mr. McFarlane received his degree in Electrical Engineering from the University of British Columbia in 1957.

JOHN ALLAN
Energy, Mines and Petroleum Resources

Mr. John Allan is the Director of the Energy Policy Branch in the B. C. Ministry of Energy, Mines and Petroleum Resources. He was formerly the director of the Forecasts and Special Projects Branch and Senior Policy Advisor, Electricity, in the Ministry. Mr. Allan holds an M.A. in Economics from Queen's University in Kingston, Ontario.

B.C.Hydro

Annual Corporate Planning Cycle



ANNUAL FORUM — June

20-YEAR LOAD FORECAST — July

CORPORATE STRATEGIC PLAN — September

CORPORATE MARKETING PLAN — November

RESOURCE PLAN (20 Yrs.) AND ELECTRIC SYSTEM PLAN (10 Yrs.) — December

PRELIMINARY CORPORATE FINANCIAL PROJECTIONS — January

GROUP BUSINESS PLANS — February

CONSOLIDATED CORPORATE BUSINESS PLAN — March

APPROVAL BY BOARD — 31 March

B.C.Hydro

Corporate
Strategic
Plan

"Proud of our service"

Mission

To support the economic growth of British Columbia through the efficient supply of electricity.

Objectives

- To maximize our contribution to the economic development of British Columbia
- To be the most efficient utility in North America
- To be recognized by our customers as a superior marketing and customer service oriented company
- To be one of the best employers in British Columbia

Values

We, as employees of B.C. Hydro, value:

- integrity
- commitment
- teamwork
- innovation
- technical and professional excellence
- community involvement
- our natural environment
- open communication
- equal opportunity
- employee and public safety
- achievement of results

"Proud of our service"

Management Principles

- Focus on our customers
- Invest in our number one asset — employees
- Anticipate and respond to change
- Manage environmental matters responsibly
- Be accountable for defined results
- Purchase external services where cost effective in preference to hiring
- Shorten lines of communication
- Add value to decisions through cooperation and consultation
- Test our costs against the market
- Identify our products and know costs

Group Mandates

Corporate Affairs

To provide the focal point for corporate planning, policies, communication and environmental criteria, to develop resource plans and to manage the corporation's media, government and regulatory affairs.

Customer Services

To provide for the delivery of quality customer services, to manage distribution facilities and to coordinate domestic and export marketing.

Production

To operate and maintain Hydro's generation, transmission, substation and associated facilities, to optimize the management of water resources, to market short-term electricity export and to administer transmission energy purchase and supply contracts and prevailing regulatory export permits and licences.

(continued over)

Group Mandates *(continued)*

System Development

To plan, develop, design and construct an economic, safe, reliable and secure power system, to provide engineering services to the corporation and to manage external engineering resources when required.

Human Resources

To implement and maintain effective programs which contribute to a competent and motivated work force, with high levels of performance, accountability and innovation.

Finance and Administration

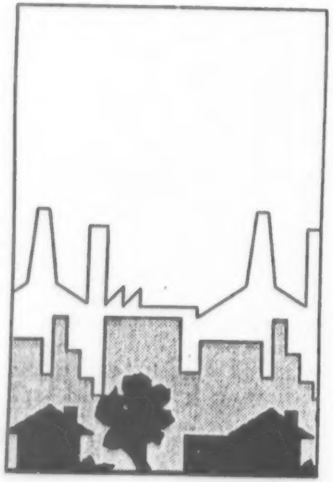
To effectively and efficiently manage Hydro's financial affairs and provide administrative services.

B.C.Hydro

Demand Side Management

A Strategic Plan for Efficient Use of Electricity

June 1988



Demand Side Management (DSM)

At B.C. Hydro, our objective is to provide electricity at the lowest long-term cost to you, our customers in British Columbia.

That's why, to us, customer service means more than supplying electricity. It means tailoring our service to meet the specific needs of you, our customers, and helping you find the best available products and applications so you can get the most value for your electric energy dollars.

And it's why, to us, planning means more than just building power plants and transmission lines. It means cutting costs, both financial and environmental, and avoiding waste, by getting the most efficient use from those provincial resources that are dedicated to the generation and transmission of electricity — another way that British Columbians get the best possible return for their investment in Hydro.

A Customer-oriented Planning Strategy

So, like many other North American utilities in the 1980s, Hydro has adopted customer-oriented Demand Side Management.

This is a service and planning strategy which gives more emphasis to the customer's need for efficient, secure electric service — the "demand" side — while still recognizing the importance of building dams and powerlines — the "supply" side — when needed.

Demand Side Management

Under customer-oriented Demand Side Management, we maximize the use of existing facilities by helping you reduce your energy consumption — not by doing without, but through programs that actually enhance your lifestyle through efficient use of electricity. The energy saved becomes available to satisfy future needs, delaying the requirement to build new power plants.

Being customer-oriented — or user-friendly, to borrow a computer term — these programs are tailored to fit the requirements of particular customer groups. So you'll find some programs specifically designed to help industrial, commercial or residential customers, and others that benefit customers in various geographical regions.

In all cases, however, the programs are designed to increase efficiency in the use of electricity — making the most of its versatility — without compromising the individual lifestyles and business methods of our customers.

Demand Side Management — Both Now and in the Long Term

Demand Side Management programs save you money by giving you the same convenient, reliable electric service at a lower cost. You cut your electric bills fast, and painlessly, while still enjoying the full comfort and convenience of modern electric service. That's the immediate benefit.

But that's not all. Demand Side Management programs create long-term savings, too, both for you and for us. They do this by eliminating or deferring the need for costly new power plants and the corresponding rate increases that would be necessary to recover the cost of building these facilities.

Within 20 years, Demand Side Management is expected to free up enough energy to allow postponement of one or two full year's allotment of new generation projects.

It may not seem very significant to postpone building a dam for a year or two, but look at it this way: it provides the equivalent of a major new generating facility at far less than the cost of such capital-intensive projects. And this means you will pay lower rates over the long term than would otherwise be possible. You'll get more comfort and convenience from your electric service, yet you'll be paying less because Demand Side Management programs use less electricity.

Demand Side Management — Programs Designed for You

Demand Side Management programs work because they let customers actively participate. You'll want to take part in the programs designed for your particular situation because you can benefit in one or more of three ways:

1. You get all the benefits of electric service – convenience, reliability, efficiency — but at a lower operating cost.

2. You may get an immediate financial incentive, such as a cash rebate, a low-interest loan or discounted electricity rate.

3. You play an important role in delaying the need for new generating facilities, resulting in lower rates for you and for all customers over the long term.

And you make it easier and less costly for us to serve you, by giving us more planning flexibility an reducing our cash requirements.

We offer a wide variety of Demand Side Management programs. Some are already in place, others a in the development stage and still more are planned come into effect within the next year or two.

Many Ways to Participate

All Demand Side Management programs will help keep the cost of providing electric service down over the long term. And it's more than likely that at least one will benefit you or your company directly over the short term, too. Here are some of the programs already initiated.

Electric Plus (Dual-fuel interruptible heating)

Who can save: Owners of homes and businesses which now use oil or propane for space and water heating.

How it works: Discounted rate for surplus electricity; customer maintains back-up fuel system for periods when surplus is unavailable and supply must be interrupted to maintain basic service.

Energy Saving Fluorescent Lamps*

Who can save: Business customers, especially those with office buildings.

How it works: 25-cent-per-lamp rebate as cost incentive to reduce initial purchase price; Hydro works with customers, large institutions and lamp manufacturers to expand awareness of potential benefits.

Diesel Areas

Who can save: All residential, commercial and industrial customers in areas where electricity is supplied by local fossil fuel-fired generating plants (usually diesel).

How it works: Several programs are offered to help customers in these areas reduce consumption; most programs involve financial incentives. Results of the "diesel" area programs will help determine whether some of them should be extended to the integrated system to reduce overall load.

Hot Water Tank Jackets†

Who can save: Homeowners with electric water heaters that do not have foam or heavy fibreglass insulation.

How it works: Hydro will supply and install, free of charge, an insulating jacket for each such water tank to reduce heat loss, resulting in lower bills for customers and reduced electric demand.

Refrigerator Buy-Back††

Who can save: Residential customers with unnecessary second refrigerators (an estimated 15% of all homes).

How it works: The extra refrigerators, usually older and less efficient than today's models, are bought by Hydro and disposed of free of charge; customers get cash rebates while Hydro reduces unwanted firm load.

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* Operated as a pilot program from Jan to Apr '88 in the GVRD only.
† Operated initially as a pilot project in selected communities.
†† Operated as an experimental project in the Queen Charlotte Islands only at the present time.

B.C.Hydro
Bringing energy to life.

DRAFT POLICY ON
PURCHASE OF ELECTRICITY BY B.C. HYDRO IN INTEGRATED AND NON-INTEGRATED AREAS

10 June 1988

SUMMARY

The purpose of this draft policy on "Purchase of Electricity by B.C. Hydro in Integrated and Non-Integrated Areas" is to present B.C. Hydro's current view and to invite comments. A final policy will be issued by 1 October 1988.

Under the proposed policy, B.C. Hydro (BCH) will purchase electricity from parallel generators on the integrated and non-integrated systems, provided the price is lower than the cost of electricity from alternative sources. BCH will enter into purchase contracts of 20 years or more.

Proposals will be called as required for purchases of electricity from projects on the integrated system with a capacity of 5 MW or more, or for projects on the non-integrated system. The purchase price and other conditions will be negotiated.

BCH will negotiate financial arrangements which are of benefit to both the parallel generator and BCH. These financial arrangements could take the following forms:

1. Front-loaded Prices
2. Low Interest Loan
3. BCH Grant
4. Cogeneration Incentives: new Tariffs
   simultaneous buy-sell

To minimize transaction costs and to facilitate development of parallel generation from projects on the integrated system with under 5 MW capacity, standard conditions will apply and BCH will pay between 2.5¢/kW.h and 3.0¢/kW.h (in 1988).

In the fall of 1988 BCH expects to issue a Request for Proposals for 100 MW to 200 MW for the integrated system. In the spring of each year BCH proposes to accept as much as 25 MW in blocks of less than 5 MW. Requests for Proposals will also be issued from time to time for service to specific non-integrated areas. Under certain conditions wheeling services will be provided to parallel generators.

For additional information contact:

Mr. J.E. Elliott, Manager
Export and Interutility Marketing
9 - 970 Burrard Street
Vancouver, B.C.
V6Z 1Y3
Telephone: 663-2019

DRAFT POLICY ON PURCHASE OF ELECTRICITY BY B.C. HYDRO IN INTEGRATED AND NON-INTEGRATED AREAS

Table of Contents

		Page
1.	Introduction	1
2.	Purchase Prices and Financial Arrangements	4
	A. Purchase Price for Firm Electricity on the Integrated System	4
	a) Projects under 5 MW	4
	b) Projects over 5 MW	4
	B. Purchase Price for Electricity in the Non-Integrated Areas	5
	C. Financial Arrangements	6
	a) Front-Loaded Prices	6
	b) Low Interest Loan	6
	c) BCH Grant	6
	d) Cogeneration Incentives	7
3.	Reaching a Purchase Agreement with B.C. Hydro	7
	A. Requests for Proposals	7
	B. Procedure for Agreement and Electricity Delivery	8
	C. Information Required in a Proposal	10
4.	Technical Requirements	11
	A. Performance of Parallel Generators	11
	B. Interconnection	12
5.	Wheeling Services	13
	GLOSSARY	Appendix 1

1. Introduction

In its efforts to achieve the most efficient electric supply for B.C., B.C. Hydro (BCH) wishes to develop a policy for purchase from parallel generators. If a cost-effective parallel generation industry can be developed, it will allow deferral of more costly projects on the integrated system and reduce losses in non-integrated remote communities. The purpose of this document is to present BCH's current view in draft form and to invite comment. A final policy is expected by 1 October 1988.

Parallel generation is defined as electricity generation from an independent or privately owned facility which is connected to the BCH system, and includes self-generation and cogeneration (co-production of steam and electricity) where there may be no net sale of electricity to BCH. Parallel generation could be developed for the integrated BCH transmission (60 kV and above) or distribution systems (less than 60 kV) or for non-integrated (remote) areas served by BCH.

BCH will purchase electricity from parallel generators on the integrated system when new generation is required and provided the price is lower than the cost of electricity from alternative sources. Electricity purchase could also include arrangements made with cogenerators who reduce load on BCH's system. Requirements for energy and capacity as well as the estimated cost of electricity from alternative sources are summarized in the BCH Twenty-Year Resource Plan, which is revised annually.

BCH will purchase electricity from parallel generators in the non-integrated (remote) areas where the price is lower than the avoided cost of electricity from the BCH generating station.

At present, the B.C. forest industry accounts for about 470 MW (about 5 percent of BCH's total installed capacity) of parallel cogeneration in B.C., and there is potential for further development. BCH wishes to encourage the installation of additional cogeneration facilities. New cogeneration facilities could be installed to reduce customer load on BCH or for net sale of electricity to BCH.

To pursue electricity purchases and assist parallel generators BCH will:

a) Enter into long term electricity purchase contracts as new generation is required for the integrated system.

b) Provide pertinent technical details about BCH's system.

c) Comment on acceptable proposals, identify requirements and estimate the cost of tie lines and special interconnection equipment (including required modifications to existing BCH facilities).

d) Explore alternative financial arrangements with appropriate guarantees to assist developments on the non-integrated system and developments with a capacity of 5 MW or more on the integrated system.

e) Wherever possible, provide standby and emergency service to the parallel generator.

f) Provide wheeling services or equivalent buy-sell arrangements to serve incremental load within B.C. and support Provincial economic development goals while maintaining the interests of BCH's existing customers.

g) Expedite the process of reaching a purchase agreement for electricity.

1. Introduction

In its efforts to achieve the most efficient electric supply for B.C., B.C. Hydro (BCH) wishes to develop a policy for purchase from parallel generators. If a cost-effective parallel generation industry can be developed, it will allow deferral of more costly projects on the integrated system and reduce losses in non-integrated remote communities. The purpose of this document is to present BCH's current view in draft form and to invite comment. A final policy is expected by 1 October 1988.

Parallel generation is defined as electricity generation from an independent or privately owned facility which is connected to the BCH system, and includes self-generation and cogeneration (co-production of steam and electricity) where there may be no net sale of electricity to BCH. Parallel generation could be developed for the integrated BCH transmission (60 kV and above) or distribution systems (less than 60 kV) or for non-integrated (remote) areas served by BCH.

BCH will purchase electricity from parallel generators on the integrated system when new generation is required and provided the price is lower than the cost of electricity from alternative sources. Electricity purchase could also include arrangements made with cogenerators who reduce load on BCH's system. Requirements for energy and capacity as well as the estimated cost of electricity from alternative sources are summarized in the BCH Twenty-Year Resource Plan, which is revised annually.

BCH will purchase electricity from parallel generators in the non-integrated (remote) areas where the price is lower than the avoided cost of electricity from the BCH generating station.

At present, the B.C. forest industry accounts for about 470 MW (about 5 percent of BCH's total installed capacity) of parallel cogeneration in B.C., and there is potential for further development. BCH wishes to encourage the installation of additional cogeneration facilities. New cogeneration facilities could be installed to reduce customer load on BCH or for net sale of electricity to BCH.

To pursue electricity purchases and assist parallel generators BCH will:

a) Enter into long term electricity purchase contracts as new generation is required for the integrated system.

b) Provide pertinent technical details about BCH's system.

c) Comment on acceptable proposals, identify requirements and estimate the cost of tie lines and special interconnection equipment (including required modifications to existing BCH facilities).

d) Explore alternative financial arrangements with appropriate guarantees to assist developments on the non-integrated system and developments with a capacity of 5 MW or more on the integrated system.

e) Wherever possible, provide standby and emergency service to the parallel generator.

f) Provide wheeling services or equivalent buy-sell arrangements to serve incremental load within B.C. and support Provincial economic development goals while maintaining the interests of BCH's existing customers.

g) Expedite the process of reaching a purchase agreement for electricity.

h) Consider special arrangements for demonstration projects promoting new technology or promising significant environmental or social benefits to the province.

To receive a purchase agreement with BCH the parallel generator must:

a) Be located within BCH's service area or within an area supplied only by BCH.

b) Supply its own requirements at the generating site before selling electricity to BCH (only electricity surplus to the parallel generator's requirements will be purchased except as discussed in Section 2.C.(d)).

c) Meet utility standards for electricity quality, reliability of supply, and safety.

d) Provide contractual assurances of quantities of electricity to be delivered.

e) Pay for interconnection costs and required modifications to existing BCH facilities.

f) Retain a third party Professional Engineer to oversee all critical design aspects of the project and interface with BCH.

g) Show evidence of financial capability to the satisfaction of a qualified third party.

The parallel generator must comply with all regulatory requirements.

2. Purchase Prices and Financial Arrangements

2.A. Purchase Price for Firm Electricity on the Integrated System

a) Projects Under 5 MW

Although BCH generally intends to negotiate purchase contracts, BCH will establish a fixed purchase price for small projects to minimize transaction costs. The purchase price will be fixed annually at a value that reflects BCH's short term marginal cost (presently about 1.5¢/kW.h) and long term marginal cost (estimated at approximately 3.4¢/kW.h in today's dollars). For purchases beginning in 1988 and extending for a minimum period of 20 years, BCH will pay between 2.5¢/kW.h and 3.0¢/kW.h. The actual price will be set by 1 October 1988 and will be adjusted annually, indexed to changes in BCH's marginal costs. Purchase is subject to BCH's need for electricity and the capability of BCH facilities to accept electricity deliveries.

b) Projects Over 5 MW

For projects with a capacity of 5 MW or more the purchase price will be negotiated. The intent is to negotiate a price that provides an adequate return to the parallel generator, but which falls between BCH's estimated short term and long term marginal costs of electricity, and reflects the values of firm and secondary energy.

At the option of the parallel generator the purchase price could be either adjusted annually based on changes in marginal costs or determined through negotiation and fixed for a number of years.

Factors affecting the negotiated purchase price include:

i) Firmness of the parallel generator's annual energy deliveries,
ii) Reliability of supply,
iii) Duration of supply,
iv) Impact of the parallel generator on the transmission and distribution system, e.g. cost and timing of system reinforcements or effect on system stability.

In all cases, the purchase price will be adjusted to reflect increases or decreases in system transmission and transformer losses caused by the parallel generator. Loss adjustment factors will be adjusted as changes are made to BCH's system.

2.B. Purchase Price for Electricity in the Non-Integrated Areas

The following areas comprise the non-integrated (remote) diesel districts served by BCH at the present time:

Anahim Lake
Atlin
Bella Coola
Dease Lake
Eddontenajon
Fort Nelson
Kitkatla
Masset
Sandspit
Telegraph Creek

Negotiations or discussions are in progress which could result in all or part of the load of Atlin, Bella Coola, Masset, and Sandspit being served by parallel generators. Integration of Kitkatla is under review. Information on loads, fuel costs and unit energy costs for each area is available from BCH.

BCH will purchase electricity within the service area of a BCH remote generating station at a negotiated price based on the parallel generator's costs and the estimated reduction of BCH's costs. The negotiated price may also contain a reliability component.

If BCH is required to retain staff and equipment at the diesel generating station to provide security of supply and to serve load growth, then the price for purchased electricity will be lower because the diesel generating station could not be permanently displaced.

2.C. Financial Arrangements

For projects of 5 MW or more on the integrated system and for projects on the non-integrated system, BCH will negotiate financial arrangements that are of benefit to both the parallel generator and BCH. The purpose is to make the project economic and financeable for the parallel generator without imposing undue risk on BCH. However, expected total costs to BCH over the term of the agreement must be lower than the estimated cost of electricity from other sources. Financial arrangements could include:

a) Front-Loaded Prices: Front-loaded prices for electricity purchased from the parallel generator which improve project cash flows in early years and which may improve the parallel generator's ability to obtain financing. Front-loaded prices result in overpayments for electricity in the early years of the project life in exchange for underpayments in the later years. The intent is to ensure that the present worth of payments would be the same as the present worth of payments at prices based on the actual cost of power in each year. As there could be some business risk of non-performance by the parallel generator in later years, BCH will require performance guarantees.

b) Low Interest Loan: BCH may offer a low interest loan to the parallel generator to be repaid over the term of the contract for electricity purchase.

c) BCH Grant: BCH may offer a grant to the parallel generator to reduce the capital cost in exchange for lower purchase prices.

d) Cogeneration Incentives: For industrial plants or large commercial operations, BCH may offer special incentives to encourage the installation of new or additional cogeneration facilities. BCH may also consider new Electric Tariffs for supplementary and back-up supply or simultaneous buy-sell of electricity, in order to reduce impediments to cogeneration.

The basis for the price of electricity from a proposed cogeneration facility will be the difference between the cost of electricity from alternative sources and the Electric Tariff rate applicable to the cogenerator for electricity purchased from BCH.

The foregoing financial arrangements are expected to provide for equivalent economics to a specific parallel generator based on the present worth of the total cost of assistance and the payments for electricity by BCH over the term of agreement. Performance guarantees will be required.

3. Reaching a Purchase Agreement with B.C. Hydro

3.A. Requests for Proposals (RFP)

BCH will generally take a "competitive negotiation" approach to electricity purchase and will, from time to time, request competing proposals for blocks of firm electricity supply. RFP's will be issued separately for electricity purchase:

a) On the integrated system - generating capacity 5 MW or more,

b) On the integrated system - generating capacity less than 5 MW,

c) In non-integrated areas.

Proposals on the integrated system with generating capacities of 5 MW or more or for electricity purchase in non-integrated areas will be evaluated on the basis of price, amount of firm electricity, fuel type (if any), location, dispatchability, expected reliability and contract term. BCH will commence negotiations with the potential supplier that has the best proposal based on this evaluation. Any electricity purchase negotiations underway prior to the competition will be continued to completion and will not be adversely affected by the results of a competition process.

In the fall of 1988 (Oct-Nov) BCH expects to issue an RFP on an experimental basis for 100 MW to 200 MW for the integrated system. BCH intends to issue annually similar RFP's in blocks of 5 MW or more, following preparation of a Resource Plan.

RFP's will also be issued from time to time for service to specific non-integrated areas. More specific information on the timing and location of new generation requirements from parallel generators will be issued with the RFP's.

Proposals for electricity purchase from projects on the integrated system with generating capacities below 5 MW will be ranked only if the total proposed generating capacity exceeds the size of the block of electricity supply identified in the RFP. The price will be fixed as discussed in Section 2.A above and standard conditions will apply to minimize transaction costs.

For projects under 5 MW BCH proposes to offer a three-month window in the spring of each year for as much as 25 MW of capacity.

3.B. Procedure for Agreement and Electricity Delivery

The procedure for reaching a purchase agreement depends on the size and complexity of the parallel generation development. However, the general stages can be summarized as follows:

	Parallel Generator	B.C. Hydro
1.	Enquiries or discussion of conceptual plans	Request for Proposals
2.	Proposal	Expression of Interest Comment on Proposal Preliminary Determination of Interconnection Requirements and Estimate of Cost
3.	a) Execute Purchase Contract (projects under 5 MW on the integrated system)	
or	b) Negotiate Contract (projects 5 MW and over on the integrated system and all projects in non-integrated areas)	
4.	Project Design	Comments on Project Design Final Determination of Interconnection Design and Cost Estimate
5.	Execute Operating Agreement and/or Develop Local Operating Orders	
6.	Payment for Interconnection	Procurement of Material Project Construction Construction of Interconnection Facilities
7.	Commissioning	Witness Commissioning Interconnection Testing Give Approval to Deliver Electricity

3.C. Information Required in a Proposal

The potential parallel generator should include the following information in a proposal for electricity sale to BCH:

- general description of the proposed project, including conceptual design,
- location map,
- power plant capacity, size and number of generators,
- routing of the proposed intertie line and voltage at point of interconnection (in consultation with BCH),
- location of proposed interconnection to the BCH system,
- information on protection and control equipment,
- estimates of annual and monthly firm energy deliveries to BCH,
- preliminary single-line electrical drawing,
- arrangements for operation and maintenance of the parallel generator's generation and transmission/distribution equipment,
- estimates of annual fixed and variable costs (for projects larger than 5 MW and for projects in non-integrated areas),
- term of the proposed purchase agreement,
- financial statements and other relevant data to indicate the parallel generator's financial capability.

BCH expects the proposal to demonstrate the financial and technical soundness of the project.

Please direct proposals and requests for information to the following person:

Mr. J.E. Elliott, Manager
Export and Interutility Marketing
9 - 970 Burrard Street
Vancouver, B.C.
V6Z 1Y3
Telephone: 663-2019

4. Technical Requirements

4.A. Performance of Parallel Generators

The parallel generator's plant should emulate the performance of BCH's generating stations and must not reduce the standard of customer service on the utility system.

In order to assist its planning process for new plant additions and electricity purchases for the integrated system, BCH will require contractual assurance of annual firm energy deliveries. This may be accomplished by a purchase price structure that encourages delivery of a constant or predetermined amount of firm energy in each year of operation.

The parallel generator's output capability must be reliable (maintain high capacity factor and low outage frequency) in all locations because intermittent operation could cause customer disturbances (e.g. voltage changes, flicker, unbalance, or protection problems). In some cases, especially for large projects, BCH may wish to dispatch plant capacity (i.e. control or regulate the plant output). BCH will control the operation of the tie line and the amount of delivery as necessary for the reliability and security of the BCH electric system in order to maintain the quality of electricity supply to BCH customers.

In non-integrated areas, failure of the parallel generator's supply could cause a customer service interruption, depending on the relative size of the parallel generator's supply and BCH's diesel units on-line. Thus, the parallel generator's reliability of supply is of particular concern and BCH may require the parallel generator to submit a Professional Engineer's feasibility study of the proposed generation facility.

As BCH is seeking long term firm supplies of electricity, the term of a purchase contract should be at least 20 years and parallel generators should design their plant accordingly.

4.B. Interconnection

Interconnection of the parallel generator with BCH's integrated or non-integrated systems involves technical and safety issues which are presently under review by BCH.

Generally, interconnection facilities are intended to:

a) Provide adequate capacity to deliver the parallel generator's maximum output to BCH.

b) Provide and maintain electrical protection equipment to protect the parallel generator's and BCH's equipment, and ensure the safety of workers and the public.

c) Maintain high standards of reliability and quality of electricity supply to BCH customers.

d) Provide metering of amounts of electricity produced and consumed by the parallel generator.

The parallel generator will be responsible for interconnection costs, including costs of modifications or additions that may be required to BCH's system. Modifications or additions which provide benefits to BCH, other than the interconnection to the parallel generator's supply, will be paid partly by BCH.

The time required for interconnection depends on the size and type of generator and the transmission or distribution system requirements. In the near term, while BCH is dealing with policy and sometimes complex technical issues, the time required for design and implementation could be long. As experience is gained with parallel generation, BCH expects the following allowances will be adequate.

a)	Interconnection for small induction generators on the distribution system	3-6 months
b)	Interconnection for synchronous generators and large induction generators	6-12 months
c)	Interconnection at transmission voltages (60 kV-500 kV) where line extension or system reinforcement is required	1-3 years

An estimate of time and cost of construction could be provided after a preliminary review.

5. Wheeling Services

BCH will provide wheeling services to parallel generators wishing to sell their electricity to someone other than BCH as long as the BCH system has the extra capacity to carry the added electricity. However, wheeling will not be provided to existing BCH customers unless:

a) The parallel generator's electricity serves the BCH customers' incremental new load; or

b) The parallel generator serves the load of another facility in B.C. in which he has controlling interest.

Rates for wheeling, standby and load shaping are presently under development. Arrangements for wheeling more than 5 MW will be negotiated on an individual basis.

The charges for any system reinforcement (apart from extension or interconnection facilities) required to provide wheeling services will be determined by BCH for each case.

Studies required to determine the feasibility of a specific wheeling proposal will be done by BCH at the expense of the proposer.

APPENDIX 1

Glossary

Avoided Cost - The cost of energy from the next lowest cost alternative generation.

Capacity Factor - The average power output for an energy system divided by its rated power output.

Cogeneration - The simultaneous production of mechanical or electrical energy and useful thermal energy in the form of steam or hot water from a single energy (fuel) source.

Dispatchable - The ability to regulate the parallel generator's electrical deliveries to the utility system.

Financeable - Sufficiently secure to permit the proponent to obtain financing for his or her project.

Firm Capacity - The assured contribution that a parallel generator might make to the overall electrical capacity (kW) supplied to BCH.

Firm Energy - The assured contribution that a parallel generator might make to the overall electrical energy (kW.h) supplied to BCH.

Front-Loaded - Higher payments by BCH for electricity deliveries in the early years of a project balanced by lower payments in later years in order to permit more rapid repayment of the parallel generator's debt.

Integrated System - The interconnected network of transmission lines and substations linking generating stations to one another and to customers.

Load Shaping - A service provided by a wheeling utility where one party receives the electricity at a time not coincident with the time the other party supplies the electricity.

Local Operating Order - Detailed operating instructions used by workers to operate B.C. Hydro's electrical system in a local area.

Long Term Marginal Cost - The cost of serving the next increment of new load by constructing new generating facilities or making new power purchases over the next 20 year period.

Parallel Generator - A person or company whose independent generating facility is connected (electrically in "parallel") to a utility system such that electricity may be sold to and purchased from the utility.

Present Worth - The present sum which if deposited with interest at a given rate would exactly provide funds for a scheduled future payment or series of payments.

Secondary Energy - The unassured contribution that a parallel generator might make to the overall energy supplied by a customer to BCH.

Self Generation - Generation of electricity by a customer for its own use.

Short Term Marginal Cost - The cost of serving the next increment of new load with existing facilities and purchases and with allowance for export sales.

Standby - Service provided to a BCH customer normally receiving wheeled electricity when the supplier of wheeled electricity fails to supply.

System Transmission Losses - Losses of electricity caused by line resistance, transformation, etc.

Wheeling - The transfer of one party's electricity to a second party over a third party's transmission system.

SURVEYS

DEMAND SIDE MANAGEMENT SURVEY

DEMAND SIDE MANAGEMENT FEEDBACK FORM

Information from the Demand Side Management Feedback Forms was compiled and weights assigned which were inversely proportional to the order of selection (i.e. under Residential DSM Programs - assuming 6 selections were ranked, the first was assigned a weight of 6, the second 5, and so on. The weights for each item were subsequently totalled).

FIRST ANNUAL
ELECTRIC
ENERGY
FORUM

Demand Side Management Feedback Form

As B.C.Hydro develops Demand Side Management (DSM), we would like your input to help focus our efforts. Please take a moment to complete this form. Thank you.

1. PRODUCT OR SYSTEM AREAS TO ADDRESS:

The following are areas that we intend to address with DSM programs. Blank spaces are provided so that you may add other areas that you see as valuable. Then please rank all items in order of importance to you, with 1 being the most important.

Residential

☐ Encourage natural gas space heating	38	☐ Efficient lighting programs	48
☐ Encourage natural gas water heating	26	☐ Encourage double glazing	3 (1 response)
☐ New construction standards	67	☐ Encourage passive solar	1 (1 response)
☐ Retrofit of existing houses	59	☐ Promote retail availability	12 (2 responses)
☐ Efficient appliance programs	42	☐ Change electric tariffs	2 (1 response)

Commercial

☐ Lighting programs	53	☐ Energy efficient motors	33
☐ New building design standards	46	☐ Change electric tariffs and connecting fees	8 (3 responses)
☐ Retrofit of existing buildings	31	☐ Encourage double glazing	2 (1 response)
☐ Controls	37	☐ Encourage cogeneration	1 (1 response)
		Encourage passive solar	3 (1 response)

Industrial

☐ Energy efficient motors	59	☐ New plant assessment	43
☐ Adjustable speed drives	55	☐ Change electric tariffs	9 (2 responses)
☐ Lighting programs	39	☐ Encourage cogeneration	6 (2 responses)
☐ Compressed air systems	31	☐ ______________________	
☐ Energy audits	41	☐ ______________________	

2. TYPES OF INCENTIVES:

The following are types of incentives that may be used in conjunction with some programs. While the incentive approach will be somewhat dependent on the type of program, please indicate if some approaches are more preferable to others. Indicate areas of interest by ranking the following (1 to 5) with 1 being the most preferable.

☐ **Rebate per unit of product** (i.e. x¢ per 34-watt lamp or $y per horsepower of energy efficient motor)	32
☐ **Rebate per unit of energy saved** (i.e. x¢ per kilowatthour of electricity)	42

☐ **Payback period** 40
(i.e. If required payback is three years, incentive would be the amount necessary to reduce cost to provide a three year payback.)

☐ **Assured saving** 31
(i.e. A guarantee that a minimum level of savings will be achieved.)

☐ **Shared saving** 31
(i.e. B.C.Hydro or a third party would finance the retrofit and share the resulting savings.)

☐ **Other** Provide penalties for inefficient customers (1 response) 5

3. FINANCIAL REQUIREMENT FOR ENERGY SAVING INVESTMENTS:

Does your organization have pre-defined objectives against which investments are measured? If so, please check which method is used, and if known, the criteria.

☐ **Payback Period** Criteria 1 to 5 (over 50 percent of respondents use Approx. 2 years) (i.e. number of years) 6

☐ **Return on Investment (ROI)** Hurdle Rate 15 to 30 percent (i.e. ROI must exceed this rate) 9

☐ **Life Cycle Costing** 6
(i.e. the alternative with the lowest overall cost)

☐ **Other** Lifestyle improvement (1 response) 1

4. ABOUT YOURSELF (optional):

Name: ______

Company: ______

Address: ______

______

Telephone: ______

5. FURTHER DISCUSSION:

☐ **I would like to discuss DSM ideas further with someone from B.C.Hydro.**

POWER PURCHASE SURVEY

1. At the design stage the parallel generator must provide evidence of financial capability and a review of his plant design by a professional engineer.

   Responses

   - What will this evidence consist of? One must realize that it is relatively easy to get comfort letters from banks and these letters do not mean much! There is also the "who first?" situation: the banks will not provide funds until a contract is signed and BCH will not sign a contract until funding is in place.
   - Okay - fair requirement (7 responses).
   - This makes sense provided bureaucratic delays do not kill the project.
   - Presumably, the financial capability will be first, followed by negotiation, then followed by a review of plant design. There is no use in doing detailed engineering until the negotiations are completed.
   - Plans submitted should not be reviewed by a professional engineer, except as related to safety and BCH line protection. The parallel generator should not be required to provide evidence of financial responsibility, except as related to joint works.
   - The professional engineer should be an independent third party (2 responses).
   - I believe that review of the plant design by a professional engineer is a good policy if the size of plant is over 100 kW. The financial capability of a developer at the design stage can be somewhat arbitrary. A later stage would be preferred because it is hard to get financing for a design or idea.
   - If the plant is designed by an engineering company or consultant the review is unnecessary. "Evidence of financial capability" is too broad; it provides an easy out for BCH. Financial capability should by specifically defined.
   - We feel that our project's financial viability hinges on BCH's Intent to Purchase. We would have no difficulty

proving financial capability after receiving an Intent to Purchase.

- A better definition of financial capability should be provided. In Ontario, this question is still not clear to potential developers, most of whom may have the financial capability, but not all have it in place at the design stage, i.e. prior to approval by Hydro.

2. For projects under 500 kW the purchase price will be between 2.5¢/kW·h and 3.0¢/kW·h for 1988 and for future years the purchase price will be indexed to changes in BCH's marginal costs.

Responses

- Purchase price should include a "Demand Price" as well, to account for the "freed-up" transmission, substation and generation capacity on the overall BCH system as a result of a small power producer (SPP) serving a local area surrounding the SPP location. The initial energy purchase price from the SPP should be based on BCH's long-term marginal cost. The purchase price should be indexed to annual changes in the BCH marginal cost because the SPP views his project as a new project with at least a 20-year life which also begins in 1988 (or beginning date of project). The present worth of your alternate, new energy costs should be over the same time period as the SPP's project life. The value the BCH system annual transformer and transmission line loss reduction attributable to the SPP should be added to the purchase price for SPP energy. I agree with the concept of a single purchase price for all SPP power less than 5 MW in size based on all considerations, but it should be much closer to your current retail cost of energy than your proposal is now and it should include a demand component.

- The price, as pointed out during discussion, should include avoided interest charges for dams not built (2 responses).

- How soon is BCH prepared to discuss possible opportunities? (Editor's Note - Spring of 1989).

- The price is probably too low (5 responses).

- The G.V.R.D. has completed some comprehensive studies regarding the generation of electricity from Cleveland and Seymour dams. We might update these in view of BCH's new policy.

- Costs and overheads are lower for smaller developers. Therefore, smaller developers can charge lower prices and reduce rates for ratepayers.

- The cost should be related to the cost of the next alternative which is likely 3 1/2 to 4¢/kW·h.

- Due to economies of scale, we would like to see the 1988 price for electricity set at 3.0¢/kW·h. We would prefer to see an example of how indexing to your marginal costs affects the purchase price before we comment further.

- This price is far below BCH's marginal cost. The purchase price should be equal to BCH's marginal cost.

- I would like to see the explicit methodology and assumptions that lead to this price range. What determines whether the price is at the high or low end of this range? (Editor's Note - There will be one price cited in the final version of the policy and that price is expected to be between 2.5¢/kW·h and 3.0¢/kW·h.)

3. For projects of 5000 kW or more the purchase price will be negotiated, but the negotiated purchase price must contribute to BCH's goal of being an efficient supplier of electricity.

   Responses

   - Okay in principle (6 responses).

   - Purchase prices should reflect full avoided cost unless the competitive market suppliers lower the cost (2 responses).

   - Costs and overheads are lower for smaller developers. Therefore, smaller developers can charge lower prices and reduce rates for ratepayers.

   - The purchase price should be related to the cost of Site C or other alternatives using realistic $/kW·h figures. A price of more than 3.5¢/kW·h is necessary to make many larger projects economic.

   - To examine the fairness of the limits placed on the purchase price the following factors are required: finance rate, project life, finance term, inflation rate and assumptions, discount rate and method of analysis and evaluation. These should be defined and standardized to compare alternatives.

4. In the non-integrated diesel districts purchase prices will be negotiated based on the parallel generator's cost of generation,

the estimated reduction in BCH's costs and may contain a reliability component.

Responses

- Sounds like a new name for Share-the-Savings!

- Okay in principle (6 responses).

- Okay, but why only "may"?

- BCH must be seen to be fair in these instances. In the past the general feeling was that BCH was "rigging" the figures to discourage potential small hydro developers. Atlin is an example.

- Any reduction to BCH's cost should be fully recovered by the parallel generator, subject to a correction factor for reliability.

- What is wrong with paying the full avoided cost of say 16¢/kW·h? (Editor's Note - BCH is responsible to its ratepayers, BCH must get the best price it can and 16¢/kW·h is much higher than BCH's full avoided cost.)

- Why is the parallel generator's cost of generation of interest to BCH in negotiations? Why does BCH not take the risk and build small generating plants in the non-integrated areas? (Editor's Note - BCH must be assured that the project will succeed before spending considerable time and money on negotiations and BCH must get the best price it can for ratepayers. Small producers have lower overheads and should be more efficient on small projects which should reduce costs to BCH ratepayers.)

5. Financial arrangements to help make a project economic and financeable could include front-loaded prices, low interest loan, BCH grant, or cogeneration incentives (new tariffs for supplementary back-up and supply or simultaneous buy-sell). All financial arrangements would be equivalent based on a present worth evaluation.

Responses

- Some examples with numbers would be useful.

- Seems quite generous.

- Okay - fair enough. I view BCH and the SPP as business partners looking for a "win-win" situation. I also expect that most SPPs will have little experience in raising the type of financing needed for even a modest SPP project. Any support and backing BCH can offer will be appreciated (3 responses).

- Incentives should relate to avoided interest charges as well.
- If negotiations are going to take 2+ years, we cannot wait.
- The financial arrangements are worthy of interest and negotiation (2 responses).
- The financial arrangements are needed, but the equivalence test is too inflexible.
- Any financial arrangements should not encourage paying interest on borrowed money; usury is morally wrong.
- An up-front grant is more useful to cogenerators who would be reducing their purchases from BCH by installing new generation.
- We would encourage BCH to consider financial arrangements on projects that are under 5 MW. If BCH would consider front-loading of prices, we would like to see an example of such a contract. A low interest loan over a period of less than 20 years would be of interest to us.
- The requirement for security deposits for levelized payments to ensure against default effectively negates the financeability of levelized rates. Would BCH consider security such as a junior lien on the facility or a pooling arrangement among small power producers? (Editor's Note - Yes, for projects 5 MW more, or for projects on the non-integrated system.)
- Low interest loans are of particular interest presuming BCH's cost of financing would be lower than that of a private developer. Some expression of the rate relative to a standard index such as prime, bond rates, etc., would be useful.
- The BCH grant could be similar to BCH taking an equity position in a project in return for guaranteed dividends in the form of reduced power costs, or even direct cost dividends from the project.

6. B. C. Hydro will provide wheeling services in limited circumstances, provided there is extra capacity on the line. Rates

for wheeling, standby charges and load shaping more than 5 MW will be negotiated on an individual basis.

Responses

- Under 5 MW generating capacity should have a fixed rate per kW·h wheeled per year, and perhaps update every couple of years to account for inflation or depression in the interim period.

- Wheeling will be of interest as the program becomes better defined.

- Okay (5 responses).

- We understand that a new entrant to the BCH grid would be required to pay all interconnection and modification costs. An option should be available to incorporate these costs into the wheeling charges negotiated between the parties.

- Seems very reasonable and more liberal than the Ontario Hydro policy.

7. Other comments:

Responses

- Well done, B. C. Hydro! A very good first step.

- If a private company can put energy and capacity on the system (say 50 MW) with a plant that is reliable, always available and dedicated to BCH, that company should be allowed to run its operation as efficiently as possible. If that means a 20% or more return on investment, then that is the private company's reward for efficiency. BCH has no right to pay a rate for power that gives the parallel generator a return that BCH feels is appropriate. This is particularly pertinent to larger thermal operations where equity is raised from investors.

- BCH should attempt to simplify the rate system and calculations. For example, a cogenerator will dump steam to generate additional power to avoid purchasing from BCH. This is very inefficient power, but the cogenerator cannot make an instantaneous calculation of the cost/benefit of the situation caused by the downstream effect of the demand charge on power purchases from future months. Arie van Donkelaar of Cariboo stated that in summer they vent steam to generate power, but he did not really know why.

- The section covering "special arrangements for demonstration projects, new technology or promising significant environmental or social benefits to the province" should be expanded.

- The policy indicates that the parallel generator must first supply its own power requirements. In the case of an export contract the price received and the cost of production could be higher than the current cost of power from BCH. Therefore, this requirement would not be in the parallel generator's interest.

- It would appear that BCH's calculated cost of power from Site C is derived using some fairly creative accounting. It would appear to me that you place a very low cost on new capital, not to mention an extremely low rate of return on top of this. It appears as if you base it on a 100 percent load factor. Using more business like accounting practices would give an avoided cost of 10¢ to 20¢/kW·h. This is, of course, extremely dependent on load factor. Granted it takes some long-term economics to justify a project such as Site C, but the figures that I have do not appear to fringe on reality.

- One of our concerns is your definition of firm power.

- Other than the price, I was favourably impressed by your policy. I really feel that the price for small (<5 MW and particularly <1 MW) projects will probably preclude these developments. However, maybe this price is okay in the B. C. context. In Ontario, an attractive price is required to encourage accessible, renewal energy resource development.

LIST OF ATTENDEES

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A. VAN DONKELAAR	SPEAKER	CARIBOO PULP & PAPER
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BERT WALLACE		
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MARSHALL G WASYLIW	DISTN PLNG&STUD. SPV	B.C. HYDRO
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STEPHEN D. WILSON	PROJECT ENGINEER	EMIL ANDERSON CONSTR.
HENRY WINTER		WELDWOOD OF CANADA
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RALPH G. ZUCKER	LOAD FORECAST ENGR	B.C. HYDRO

NEWSPAPER CLIPPINGS

The Province
Vancouver, B.C.
01 June 1988

Hydro gauges performance on balance

Brian Lewis
B.C. VIEWPOINT

A high-wire walker would readily tell you that balance is everything in life — and so would the people who plan the pushing of megawatts of electricity through high transmission wires.

It's the latter group which toils behind closed doors and banks of computers for B.C. Hydro. These resource planners and forecasters do a difficult and tricky job in which their basic objective is to achieve a balance between electricity supply and its demand.

If it's too heavy on the supply side we, the taxpayers, will foot the bill for financing of major hydro-electric dams only to have some of the water they collect spill over the top with not a nickle's return on our investment.

If the demand side outgrows the supply, we're in the dark.

"Attaining that balance is economic heaven for us," explains Bill Best, a Hydro vice-president who is chairman for next week's inaugural Electric Energy Forum.

This Forum — on June 9 and 10 at Richmond's Delta River Inn — represents a new step for the once-mighty Crown utility, which is co-sponsoring it with the Ministry of Energy, Mines and Petroleum Resources.

Hydro is undergoing perhaps the most dramatic change in its history in shifting emphasis from building huge hydro-electric dams today for tomorrow's power needs to reliance on smaller generating projects and power supply from the private sector.

Loosely translated, this means no more talk of building the $3.2-billion Site C project on the Peace River until after the turn of the century.

Instead balance from the electricity supply side will be met with a mix of programs that includes small private generating projects which are connected to Hydro's B.C.-wide grid.

This is termed "Parallel Generation" and will be one of two topics discussed at next week's forum.

The other topic is Demand Side Management (DSM), a program in which Hydro works with its customers to encourage more efficient use of electricity. For example, Best says a four-foot florescent tube now on the market uses six watts less electricity in giving the same illumination. "And there are between 60 and 100 million of those tubes in B.C. right now," he says.

Of course Parallel Generation and DSM work together to achieve the much sought-after balance on Hydro's system.

Hydro chairman Larry Bell says a third arm in the utility's "new" approach in providing power is through increased co-ordination with neighboring utilities such as Bonneville Power Administration in the U.S., TransAlta Utilities and Alcan. Hydro and BPA recently announced a new agreement in which Hydro will store additional water for BPA's downstream use on the Columbia River.

The bottom line to Hydro's new approach is simply this: The utility will first consider all three of the Cs — Conservation (DSM), Cogeneration (Parallel Generation) and Co-ordination — before it looks to a megaproject such as Site C.

Clearing Up
Seattle, Washington
10 June 1988

[6] REPORT FROM BC HYDRO'S ELECTRIC ENERGY FORUM: HYDRO CHAIRMAN LARRY BELL TELLS ATTENDEES THE UTILITY WILL ACTIVELY PURSUE POWER SUPPLIES FROM INDEPENDENT PRODUCERS; HYDRO IS ALSO TURNING TO CONSERVATION MEASURES :: BC Hydro Chairman Larry Bell on Thursday told those attending the utility's First Annual Electric Energy Forum that Hydro will soon call for proposals from independent power producers to serve up to 600 MW of the utility's load, for a direct BC Hydro investment of about $1 billion. The announcement came at the opening of the two-day conference, held at Vancouver's Delta River Inn and attended by over 200 representatives from the energy industry and related interests.

Bell said Hydro "is looking increasingly at non-utility supply options to meet future loads." The utility is pursuing four opportunities to develop a supply of independently produced power. First, BC Hydro wants to serve Northwest markets by developing interties with either Puget Power, Washington Water Power or both. This fall, Bell said, Hydro will issue a call for proposals to serve a load in this potential NW market of about 400 MW. Also this fall, the utility will ask for cogeneration proposals to serve between 100 MW and 200 MW of its integrated system load. This energy production "could be in the form of one large project or several small ones," Bell said, adding that indications are "we will be pleasantly surprised by the amount of cost-effective energy available."

Hydro will work on finding cost-effective supply alternatives for its small, non-integrated diesel supply areas, which have a combined load of about 35 MW. And the utility will issue a separate request for proposals to serve the community of Fort Nelson–the largest non-integrated supply area with a load of about 15 MW. Bell indicated "there are increasingly strong signs that a major pulp mill investment will be forthcoming" in Fort Nelson, adding a load of about 50 MW. Moreover, he noted, it is "conceivable that both integration and independent power supply could occur with Fort Nelson, actually exporting power to the [Hydro] grid."

The topic of Thursday's session was Demand Side Management, another strategy BC Hydro plans to pursue actively. Highlights of the day included addresses on the merits of conservation by NRDC attorney Ralph Cavanagh and energy consultant Amory Lovins, who directs the Rocky Mountain Institute in Snowmass, Colorado. A full report on the gathering will follow next week **[Kari Stout]**.

The Daily Bulletin
Kimberley, B.C.
10 June 1988

Electrical energy forum

B.C. Hydro has completed plans for its first annual electrical energy forum to discuss forecasts and alternatives for meeting future load growth.

The forum, co-sponsored by the Provincial Ministry of Energy, Mines and Petroleum Resources, will be held at the Delta River Inn, Richmond, on June 9 and 10, and will give Hydro an opportunity to consult with customers and others interested in efficient energy use and non-utility supply.

The focus over the two days will be on Demand-Side Management, where a utility works with its customers to encourage more efficient use of electricity, and on Parallel Generation, where independent power producers coordinate and sell energy to the utility.

Among the speakers will be Hydro Chairman Larry Bell, Provincial Energy Minister Jack Davis, and Amory Lovins, Director of Research at the Rocky Mountain Institute. Newsweek describes him as "one of the Western World's most influential energy thinkers". Ralph Cavanagh, Northwest Energy Project Director for the Natural Resources Defence Council, and a leading spokesman for the environmental position in the U.S. Pacific Northwest, will also attend.

Conrad Guelke, Hydro's Manager of Corporate Planning and Review and organizer of the conference, says the forum is a vehicle for consultation to enable Hydro to obtain input while resource plans are still in the formative stages. "The forum reflects Hydro's new direction and initiatives designed to postpone the construction of traditional, high-cost generating facilities, " he says.

Adds Larry Bell: "Efficiency dictates that we consider the three-C's - Conservation, Cogeneration, and Coordination."

According to Hydro's Twenty-Year Resource Plan, 21 different demand-side management programs have been identified, some of which are already underway. $7.5 million has been approved for the programs in the 1988-89 budget.

"These are intended to encourage the wise use of electricity by our customers, and will advance adoption of more efficient motors, more efficient forms of lighting and higher home insulation levels, all helping to defer the need for new generation by reducing existing electrical demand, " Bell says.

The plan also states Hydro will establish a policy for energy purchases from cogenerators and other private power producers and for energy coordination with other utilities. For example, Hydro is negotiating with Alcan Aluminum Limited to purchase surplus energy when Alcan expands its Kemano generating facilities in Northwestern B.C.

Hydro recently signed an agreement with the Bonneville Power Administration (BPA) to store energy in the form of water for BPA during excess generation when young Columbia River salmon and steelhead trout are moving downstream, through the U.S. portion of the river.

The Energy Forum is viewed by Hydro as a means of expressing its plans to the public and receiving feedback on issues which affect all customers, Hydro intends to hold similar forums on related topics on an annual basis.

The Energy Daily
Washington, D.C.
10 June 1988

The Energy Daily

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Friday, June 10, 1988

Volume 16, Number 111

Competitive Bidding And IPPs Come To Canada

BY JOHN McCAUGHEY

VANCOUVER, British Columbia—Competitive bidding for electricity generation is coming to western Canada. This fall, British Columbia Hydro, the large provincially-owned electric and gas utility, will invite independent power producers (IPPs) to submit proposals for the development of up to 600 megawatts of generation, representing an IPP investment of $1 billion (Canadian), BC Hydro Chairman Larry Bell told a 300-strong audience at a meeting here on Thursday. Bell, a former provincial deputy finance minister, took over the top job at the utility one year ago.

Although the utility has viable underdeveloped hydro potential equal to its present nominal generating capacity of about 10,500 MW, it will in the future look to independent power producers, cogenerators, increased coordination with neighboring utilities and a broad new demand side management program to meet its new load growth, which it projects in the 2-4 percent range, BC Hyrdo chief planner Ken Peterson told the conference.

BC Hydro, which embarked on a big construction program in the late 1970s and early 1980s and was then shattered by a sharp recession that forced it to stop building and almost halve its 10,000 workforce, now feels that big hydro projects are too costly and risky a path to take in an era of uncertain load growth, Peterson went on. BC Hyrdo has a peak load at least 25 percent below its nominal capacity, but, as its planners are quick to point out, the reserve margin is imprecise because hydropower (the vast bulk of the utility's operating capacity) is dependent on the caprices of the weather.

BC Hydro believes non-utility supply options can play a major role in meeting load growth in four areas, Bell told the conference. "By the mid-1990s, export opportunities are expected to develop in the Pacific Northwest with either or both of Washington Water Power and Puget Sound Power and Light," he said. "A proposal call will be issued this fall for approximately 400 megawatts to determine the costs of serving this potential

(Continued on next page)

Competitive Bidding Arrives In Canada

(Continued from page one)

market at the same time that we will be exploring contract terms with potential purchasers. Investment to serve this market would be $C600 to $C800 million in today's dollars, generating gross returns of more than $C100 million. In the latter 1990s, we see significantly enhanced export opportunities," Bell continued.

To maintain its own load, Bell said, the utility's new Twenty Year Plan calls for cogenerated power in amounts up to 2,500 gigawatt hours per year, depending on load growth. This October, BC Hydro will issue a proposal for an initial 150 MW (in projects of 5 MW and above) and 25 MW (in units below 5 MW). "Early indications suggest that we will be pleasantly surprised by the amount of cost-effective energy available," the BC Hydro boss said.

In areas of British Columbia not linked to the utility's grid, Bell also sees IPPs playing an increasingly important role. Diesel-fueled generators currently provide some 35 MW of power to these remote areas at about three or four times the cost of electricity in areas linked to the grid, but a competitive bidding system could provide power from IPPs at a lesser cost than BC Hydro's power, the utility chief believes.

Finally, the Fort Nelson area in the north of the province could provide an important market for IPPs, Bell said. A proposed new pulp mill could boost load by more than 50 MW above its present 15 MW level. BC Hydro had been planning to build a new transmision line to the area, Bell said, but it has now received a proposal to supply power from an independent producer who would rely on gas turbines. "It is conceivable that both integration and independent power supply could occur with Fort Nelson," Bell told the meeting, "actually exporting power to the grid or selling it to Alberta." The IPP proposal would involve capital spending of $C100 million and the transmission line would cost an estimated $C65 million.

At present, BC Hydro proposes only to wheel power between IPPs and its existing customers to serve incremental load, Bell added.

"Commercial opportunities," he went on, "will not be limited to parallel generation. We are also prepared to accept innovative proposals for the implementation of our proposed demand side management programs." Reflecting the Vancouver-based utility's awakening interest in the latter topic is the presence of two well-known speakers on the subject—Ralph Cavanagh of the Natural Resources Defense Council and Amory Lovins of the Rocky Mountain Institute.

The Globe & Mail
Report on Business
Toronto, Ontario
10 June 1988

B.C. Hydro seeking private-sector help for exports to U.S.

BY CECIL FOSTER
The Globe and Mail

VANCOUVER

With an eye on increased exports to the United States and shipments to Alberta, British Columbia Hydro and Power Authority is asking the private sector to spend about $1-billion in the next five to 10 years to help generate new supplies of electricity.

Individual businesses can either produce the electricity themselves or pool resources with B.C. Hydro. The provincial utility will market the supplies.

B.C. Hydro chairman Larry Bell said the money from the private sector would help the utility meet increased demand for power in the Pacific Northwest and then further south.

It would also help B.C. Hydro reduce the cost of producing power for the domestic market.

The $1-billion needed by the turn of the century will be the first of a regular pattern by B.C. Hydro to raise money for expansion from private businesses, Mr. Bell said.

"The more we learn about this trend (to private-sector participation) in the industry, the more convinced we are that this will lead to greater efficiencies and innovation," Mr. Bell told delegates to a forum sponsored by the Crown corporation in Vancouver.

While other provincial utilities — such as Ontario Hydro — buy small amounts of electricity from private companies, B.C. Hydro officials said this is the first time a major Canadian utility will rely so heavily on the private sector to provide future supplies of electricity.

This policy contrasts sharply with that of the Quebec Government, which is spending billions of dollars to develop the second phase of the James Bay project. Electricity from James Bay is also aimed at the export market.

British Columbia is currently negotiating with neighboring U.S. states for fixed-term contracts to sell them more electricity in the 1990s. It now provides power to those states only when it is needed to overcome a temporary shortage.

In addition, B.C. Hydro anticipated in a 20-year resource plan issued in March that as the price of natural gas rises, California and other states will be willing to import lower-cost B.C. electricity.

States in the U.S. Northwest are expected to switch from electricity generated by coal-fired stations while those further south will switch from coal, oil and gas-fired stations.

One of the main obstacles to the additional sales is transmission capacity from B.C. Hydro generators to the United States.

Partnership with the private sector would help the utility overcome these problems and decrease the need for B.C. Hydro to generate internally all the funds needed, Mr. Bell said in an interview.

It will also help B.C. Hydro improve its efficiency and end reliance on more expensive diesel-generated electricity.

Offers for bids will be published this fall and business people from across the country will be invited to participate, he said. While the utility will be placing emphasis on the financial and engineering skills of the potential private-sector partners, it will also be looking to ensure that the power is produced cleanly and without damage to the environment.

By going to the private sector, the utility will reduce its reliance on Government financing and help some companies — such as coal mines and forest products manufacturers — that produce electricity as byproducts to sell the power generated by disposing of waste. Among the projects to be financed by the private sector are:

● 400-megawatt projects costing between $600-million and $800-million. This would produce "annual returns of more than $100-million," Mr. Bell said.

● Building a new power plant for about $100-million in the Fort Nelson area of the province. Another $65-million will be needed for transmission lines. This plant will provide power for a new pulp mill the province hopes to develop near Fort Nelson. Mr. Bell said the B.C. Ministry of Forests is expected to make a decision on the mill by August. With the pulp mill, existing electricity loads of 15 megawatts would have to increase to at least 50 megawatts. In addition, the plant could provide electricity for neighboring communities in Alberta.

● The provision of an extra 150 megawatts of energy for the entire system. The investment needed would be between $100-million and $200-million. "This could be in the form of one large project or several smaller ones," he said.

● Investments of between $15-million and $20-million to convert from diesel production to the generation of electricity in some rural areas.

Richmond Revi
Richmond, B.C
10 June 1988

B.C. Hydro holds electrical energy forum in Richmond

B.C. Hydro is hosting its first annual Electrical Energy Forum to discuss forecast and alternatives for meeting future load growth.

The forum, co-sponsored by the Provincial Ministry of Energy, Mines and Petroleum Resources, wraps up at the Delta River Inn, Richmond today and will give Hydro an opportunity to consult with customers and others interested in efficient energy use and non-utility supply.

The focus over the two days will be on Demand-Side Management, where a utility works with its customers to encourage more efficient use of electricity, and on Parallel Generation, where independent power producers coordinate and sell energy to the utility.

Among the speakers are Hydro Chairman Larry Bell, Provincial Energy Minister Jack Davis, and Amory Lovins, Director of Research at the Rocky Mountain Institute. Newsweek describes him as "one of the Western World's most influential energy thinkers". Ralph Cavanagh, Northwest Energy Project Director for the Natural Resources Defence Council, and a leading spokesman for the environmental position in the U.S. Pacific Northwest, will also attend.

The Energy Forum is viewed by Hydro as a means of expressing its plans to the public and receiving feedback on issues.

The Sun
Vancouver, B.C.
10 June 1988

Firms eager to get into power sales

By **RODNEY NUTT**
Sun Business Reporter

The private sector is lining up to sell electricity to B.C. Hydro.

Two of B.C.'s southeast coal mines have already made proposals to the utility to build thermal coal-powered electric generating facilities; Alcan Pacific and Westcoast Energy are negotiating to sell power to Hydro; and several new companies have been established to develop electric power generation facilities in B.C.

Hydro chairman Larry Bell said Thursday the utility will look to the private sector to develop much of its future power needs.

At the opening of Hydro's first annual Electric Energy Forum, Bell called for private sector producers to submit proposals to develop up to 600 megawatts of electricity — or about two-thirds the capacity of the proposed Site C dam on the Peace River.

Among the companies vying to sell power to Hydro:

- Fording Coal Ltd. is proposing to build a 120-megawatt plant at its minesite in Elkford, according to Fording operations vice-president Jim Gardiner.
- Westar Mining Ltd. is planning a 600-megawatt thermal coal plant at its mine near Sparwood.
- Westcoast Energy Inc. (previously known as Westcoast Transmission Co. Ltd.) has made Hydro a proposal to generate 50 megawatts of power burning natural gas to supply a new pulp mill in Fort Nelson.
- Hydro is currently finalizing negotiations with Queen Charlotte Power Corp. to provide small hydro power to the Sandspit area, which currently uses expensive diesel power.
- Alcan Pacific is negotiating with Hydro to sell excess power after it completes its Kemano project in northwest B.C.
- North Pacific Power Corp. was established a year ago to develop electric-power generation facilities in B.C.
- Energy Minister Jack Davis says at least two Asia-based companies are negotiating to set up energy-intensive industries in B.C. as long as they can generate their own power and sell any excess power to Hydro.

"Buying power from the private sector is an excellent move on the part of Hydro," said Fording's Gardiner. "A thermal power plant would be a shot in the arm for southeast B.C. which has been having a rough time for the last six years or so."

B.C. Resources Investment Corp. president Jack Smith also welcomed Bell's announcement.

"Westar has been holding discussions for some time now with Hydro," said Smith. "It's a matter of working out the economics."

B.C. Resources controls Westar Mining.

The Sun
Vancouver, B.C.
11 June 1988

Hydro to set up export agency

By RODNEY NUTT
Sun Business Reporter

The B.C. government will create a crown agency to sell power to the U.S., Energy Minister Jack Davis said Friday.

"We are moving into an era where there will be export opportunities," Davis told Hydro's first Annual Electric Energy forum.

"The government will establish an agency that will monitor the U.S. market and make money by buying the power and selling it on long-term contract into the U.S."

Until now, all power sales to the U.S. have been by Hydro on a spot basis.

Davis said the new crown agency — likely to be called the B.C. Power Export Corp. — could be in place by mid-summer and will coincide with development of an over-all B.C. power export policy.

It also fits in with the government's policy of allowing the private sector into the power generation business, which until now has been Hydro's domain.

Earlier, at the same conference, Hydro chairman Larry Bell said the utility is looking to meet much of its future power needs from the private sector.

Speaking to reporters after his speech, Davis said Hydro's electric power division would remain a crown corporation.

"The power side will not be privatized," he said. "Hydro will own and operate the grid and market the power."

Four smaller divisions of Hydro — Lower Mainland gas, Victoria gas, freight, and research and development — are currently in the process of being privatized.

Davis said the government will retain indefinitely a "golden share" in the four divisions after privatization, thus preventing the transfer of ownership in the newly privatized companies without the government's approval.

Davis also said the private sector and not B.C. Hydro may build future dams in the province.

Fort Nelson News
Fort Nelson, B.C.
15 June 1988

Strong signs for Fort Nelson major pulp mill

Private sector eyed for power

FORT NELSON - British Columbia Hydro said Thursday it wants the private sector to develop much of the Crown-owned utility's future power needs.

Speaking at the opening of Hydro's first annual electric energy forum, Hydro chairman Larry Bell invited private produces to submit proposals to develop up to 600 megawatts of electricity. This would be about two-thirds the capacity of Hydro's proposed $2 billion Site C dam on the Peace River in northeastern British Columbia.

The provincial government introduced a bill Wednesday which would privatize four divisions of the public corporation.

Energy Minister Jack Davis told the legislature that "golden share" provisions in the legislation would allow the government to retain appropriate control over ownership and management.

Non-residents of Canada would not be allowed to own more than 20 per cent of the voting shares or buy more than four per cent of a public share offering "unless cabinet determines it is in the public interest," Davis said.

The chairman, chief executive officer and 70 per cent of the directors must be Canadian and live in British Columbia.

Bell estimated Thursday that private power producers would directly invest $1 billion to generate 600 megawatts of electricity.

BE CAUTIOUS

"The more we lean bout this trend (to private power producers) in the industry, the more convinced we are that this will lead to greater efficiencies and innovation," he said.

"(But) the private power industry in B.C. is still in its infancy and we must move cautiously to ensure that quality projects are built which will save customers' money in the short term as well as provide long-term security of supply."

Davis said powers given to cabinet in the bill will guarantee that rates are frozen for the next three yeas.

Hydro is also embarking on a program in which the private sector would assume generation in more remote areas to which Hydro supplies diesel-generated power.

He said there were "increasingly strong signs" that a major pulp mill may be built in the Fort Nelson area and a private power company could step in.

[22] DEMAND SIDE MANAGEMENT IS A MAJOR THEME OF BC HYDRO'S ELECTRIC ENERGY FORUM from [5]) :: The topic of Thursday's session of BC Hydro's Electric Energy Forum was Demand Side Management, which marketing program development manager Tim Newton defined as "a customer-oriented utility marketing program." Newton outlined five strategies for managing demand by working with end-users and noted that the most significant of these is "strategic conservation."

John Sheehan, Hydro's vice president of customer services, called Demand Side Management the utility's first priority resource. BC Hydro's reasons for aggressively pursuing Demand Side Management, Sheehan added, are to increase the efficiency of energy production and use and reduce the cost of energy to customers. By way of illustration, Sheehan pointed out that for each new customer the utility serves, it must invest $30,000 if the new load is to be backed up by new generation; in contrast, he said, Hydro can invest $200 million in DSM over the next 20 years to save about 3,000 GWh of energy per year. The proposed Site C project on the Peace River would cost $3 billion and contribute 4,700 GWh annually. Reducing load through DSM strategies will enable the utility to defer construction of Site C for one to two additional years, Sheehan noted, thereby reducing Hydro's revenue requirements.

Sue Hickey, BPA deputy assistant power manager for marketing, described Bonneville's experience with DSM--and conservation in particular--over the last eight years. In summarizing the energy saved through conservation programs in the Northwest, Hickey said that for the period 1980 through 1987, savings totaled 185 MW, with about two-thirds of that amount coming from the residential sector. By the year 2000, she said, energy savings are estimated to reach 180 MW for the residential sector, 270 MW for commercial buildings, and 125 MW for industrial users. These figures do not include BPA's conservation-modernization program for the region's aluminum smelters, she pointed out.

NRDC attorney Ralph Cavanagh, in a lunchtime address to forum attendees, commended BC Hydro for what he called "its leadership role in pursuing conservation." Cavanagh also offered his advice on how the utility can more effectively market power to California. Because BC Hydro cannot offer new resources for export at a competitive price, he pointed out, the Canadian utility should not ask California utilities to pay the costs of constructing those resources. Instead, Cavanagh said, if California wants energy from Canada, it should pay for Hydro's conservation. Describing the Pacific Northwest and British Columbia as "energy-intensive" because they both have and use a great deal of power, Cavanagh pointed out the region has tremendous opportunities for conservation. British Columbia should be "the Saudi Arabia of energy conservation," he said. The amount of energy available through DSM programs is greater than BC Hydro currently estimates, he alleged.

Cavanagh elaborated on how BC Hydro should "sell conservation to California," pointing out that the utility's investment in conservation allows it to market a reliable quantity of power that is backed up by Hydro's system. Selling conservation is a better economic strategy than building new dams, he said, noting that such an export policy distributes the conservation investment throughout the province's various sectors. DSM has additional benefits, Cavanagh pointed out. First, because conservation expands and contracts with need, it reduces utilities' forecasting uncertainty. In addition, he said, an effective conservation policy can make errors in a forecast less dangerous, because buildings are more efficient and require less energy.

British Columbia should be 'the Saudi Arabia of energy conservation.'

In concluding his remarks, Cavanagh said he is "heartened by the will and commitment of BC Hydro to take on this [conservation] challenge" and noted that the "conservation potential is limited only by the size of the resource." According to Cavanagh, there are more conservation opportunities available to the utility in addition to those it has so far identified.

Amory Lovins, energy consultant and director of Colorado's Rocky Mountain Institute, which conducts energy research, continued the conservation theme in a presentation to the forum Thursday afternoon. Lovins hailed what he called the "emerging prominence of BC Hydro in the conservation movement." He went on to point out that the technology involved in reducing electricity consumption is advancing rapidly, and noted that "we now can save twice as much electricity as five years ago at one-third the cost." According to Lovins, conservation can be even cheaper than operating existing hydro. Efficient lighting more than pays for itself, he said, adding, "it's not a free lunch--it's a lunch you were paid to eat." By using highly efficient lighting technologies, Lovins said, the US can maintain current amounts of lighting using only 8 percent as much electricity as currently used.

Lovins also suggested some new strategies for achieving these levels of conservation. A competitive bidding process could include auctions for weatherization and lighting of buildings, he said, and could even lead to "spot and futures markets for megawatts." Other methods mentioned by Lovins are marketable peak-load covenants, efficiency cross-marketing between electric and gas utilities, sliding-scale electricity hook-ups (whereby energy efficiency would be tied to hook-up fees), and targeted mass retrofits. As an example of the latter strategy, Lovins said that Seattle is one of five cities in the country considering retrofitting of all its commercial lighting within a couple of years **[Kari Stout]**.

Clearing Up
Seattle, Washingto
17 June 1988

17] BEARING DOWN ON BC :: [RICHMOND, BC--Here Come the Privates on A (Sort of) Level Playing Field] It was agreed publicly and privately that BC Hydro under CEO Larry Bell is not the defensive and distant dinosaur of old--these remarks and declarations taking place at the end of last week at the First Annual Electric Energy Forum in Richmond, BC, the event being co-sponsored by the aforementioned former dinosaur and the BC Ministry of Energy, Mines and Petroleum Resources. The subject matter of the forum in this first annual edition was "The Efficient Use of Electricity with Demand Side Management" and "Power Purchases from Parallel Electricity Generation." CLEARING UP's report on the conference was begun last week with Kari Stout's report at [6] and her follow-up in this issue at [5/22].

One of the signal events of the forum was the noon-hour appearance on Friday of Jack Davis, the government's Minister of Energy, Mines and Petroleum Resources, to take the assembled forumeers on a walk around the BC resources barn. The Energy Minister spoke in general terms; it was not a major policy address. But he did lay out for all to see an open wheeling policy, calling BC Hydro "the first utility in North America to open up its grid for wheeling." The price is designed to make sure that Hydro does not lose money on that account, which would in effect, sources say, limit the wheeling to new loads.

In discussing the privatization of Hydro's gas division, Davis seemed to be saying that while the gas would go private, the utility itself would not. In fact, in the forum's nearest thing to a media crush after his speech, the minister told reporters flat out that "the decision has been made not to privatize the electric side." In point of fact, the gas sale (six percent of Hydro's business) will most probably be authorized under legislation, introduced in the Parliament earlier this month, which provides a controlling share of the "privatized" company to the government.

In US parlance, the forum dealt with conservation and cogeneration. That the big British Columbia public utility has much of an interest in either one of these procedures continues to amaze a lot of people who have the utility filed under the "bigger and better builder" category. Indeed, I remember attending a conference last year in Olympia where Chairman Bell laid out an awesome British Columbia generating resource potential, both hydro and thermal; I lost count at 6,000 MW. Now Hydro is actively pursuing conservation and has decided to invest as much as a billion dollars in private cogen resources delivering an estimated 600 MW.

Of course, Site C dam on the Peace River is still a gleam in the eyes of some people at the utility, but it is significant to note that the 600 MW figure cited by Bell as the cogen purchase goal is just less than the estimated energy output of Site C, and the $1 billion/Canadian price tag for the cogen resource compares very favorably with an estimated $3.2 billion/Canadian for Site C at completion. Paper bargain or not in comparison to Site C, buying power from the private sector in British Columbia is perceived in very different ways. Seen in the context of the announced intention of the Social Credit party government to peddle the utility's gas division to private interests, the private generation purchases are perceived as examples of Premier Bill Vander Zalm's predilection to favor private business.

Note in this connection the *Vancouver Sun* editorial in THE CLIPS calling the idea "dubious," terming it a "privately owned power industry" and seeing it as an intention to build for export at the expense of domestic ratepayers. None of these things is true on the face of it, and the *Sun*'s editorial writer did not know about or take into account situations that were made manifest at the forum. One was the opinion of the private developers that BC Hydro was not particularly sensitive to the pecuniary needs of independent power developers.

A case in point was Clyde Coats of the Queen Charlotte Power Corporation, who had just finished (by his description) arduous negotiations with Hydro on a 6 MW hydro plant on Queen Charlotte Island. Coats seemed to think that Hydro had a very sharp pencil when it came to cutting a deal with a small power producer. He took the position that Hydro wanted to pay less than the amount "economic reality" should require the utility to pay the small generator. Coats argued that BC Hydro "should pay total displaced costs [i. e., avoided cost] with interest" for independent power. Coats had no interest in other methods of determining price, such as share-the-savings and return on equity. "You couldn't get a taxi to take you home on a return-on-equity basis," Coats said.

What Coats wanted was the proverbial level playing field with Hydro, where a business environment prevails, where policy is stable and where "economic reality" obtains. Not the case now, Coats believes; the playing field for trade with the US, for all its problems, is by comparison with the BC Hydro pitch "as flat as a billiard table."

If BC Hydro intends to give opportunities to coin money at ratepayer expense to private producers, directly or by cogeneration, that apparently is news to the private energy people who, by the looks of the attendance list, were the vast majority of those at the Delta River Inn conference room. Lest there be any doubt that BC Hydro wanted to extend the hand of business to the privates on its own economic terms, Chairman Bell took the stage at the end to make a couple of things clear.

He wanted it known that BC Hydro's primary obligation remained the mandate of serving customers economically; he might as well have said on a least-cost planning basis. He said that so far as he was concerned, conservation was the exact equivalent of generation. And he said the private generation initiatives made so much of at the forum needed to be seen in that context. "Because I want to tell you," Bell said, "that it's not a social program. We have to be aware of transaction costs." Moreover, it might be that BC Hydro will be able to respond to only about 10 percent of the private generation proposals that come in over the transom. And it is clear Bell was not too fond of the level playing field metaphor. "We hear a lot about a level playing field," he said. "But this is not a game of fairness, it is a game of competition."

Nothing else would make much sense to BC Hydro; as so often happens, it is economics, not ideology, that makes converts. The National Resources Defense Council's Ralph Cavanagh and Rocky Mountain Institute's Amory Lovins, forum participants, both insist that conservation and alternatives to big generation make economic sense first of all. It is obvious as well that in its negotiations for power or on wheeling the utility still must seek to protect its revenues. Converted dinosaur or whatever, one cannot expect the utility to shoot itself in the pocketbook for conservation or private initiative–not with a utility that has a 80 to 20 percent debt-to-equity ratio **[Cyrus Noë]**.

The Daily Bulletin
Kimberley, B.C.
20 June 1988

BC Hydro asks for proposals from private producers

B.C. Hydro will soon invite private power producers to submit proposals for the development of up to 600 megawatts (MW) of generation representing potential direct investment of about $ 1 billion.

Announcing this last week at the opening of Hydro's first annual Electric Energy Forum, Chairman Larry Bell said that Hydro will look increasingly to the private sector for options to meet future loads.

''The more we learn about this trend in the industry the more convinced we are that this will lead to greater efficiencies and innovation. However, the private power industry in B. C. is still in its infancy and we must move cautiously to ensure that quality projects are built which will save customers' money in the short term as well as provide long term security of supply," Bell said.

He added that Hydro currently saw four ways to start development of private power production and would be calling for proposals this fall; with specific options for export, domestic supply, diesel replacement and cogeneration with demand-site management another avenue for private sector innovation.

''By the mid-1990's we expect export opportunities to develop in the Pacific Northwest with either or both of Washington Water Power and Puget Sound Power and Light," Bell said.

A proposal call will be issued for approximately 400 MW of generation to determine the costs of serving this potential export market. At the same time, Hydro will be exploring contract terms with potential purchasers.

''Investment to serve this market would be $ 600 to $ 800 million in today's dollars generating gross annual returns of more than $ 100 million," he said.

On the domestic scene, Hydro's 20 Year Resource Plan calls for cogeneration energy from outside Hydro's integrated system. To stimulate development of this resource and learn more about how to deal with the industry, Hydro will issue a proposal call for between 100 MW and 200 MW this fall. According to Bell this will represent direct investment of between $ 100 and $ 200 million.

''This could be in the form of one large project or several small ones. We won't really know about the market until we ask for specific proposals. However, based on enquiries to date, we could be pleasantly surprised by the amount of cost-effective energy available," he said.

Bell continued that subsidies paid by customers on the integrated system to Hydro's non-integrated or diesel supply areas cost millions of dollars each year.

''We believe there are economic alternatives out there that private suppliers will be better able to exploit than Hydro and that a competitive bidding process will bring out the feasible ones. We are currently finalizng negotiations with Queen Charlotte Power Corporation to provide small hydro power to the Sandspit area at considerable savings over the cost of diesel."

Bell went on to say that hydro would call for proposals this fall for supply to specific non-integrated areas. These proposal calls could include requests for expressions of interest in community-based acquisition of total supply and distribution responsibilities on a basis that will be equitable to both integrated and non-integrated system customers.

He also announced there were ''increasingly strong signs" that a major pulp mill investment may be forthcoming for Fort Nelson and Hydro would be issuing a proposal call for service to Fort Nelson to serve either the present load of about 15 MW or this load plus a CTMP pulp mill estimated at 50 MW plus additional growth in the village.

''While integration via a transmission line has been assumed to be the most economic supply alternative to serve extra load in Fort Nelson there are indications that other options may be less costly. Westcoast Energy, for example, has presented us with an attractive prefeasibility proposal which appears to offer significant advantages.

Hydro provides service to 11 diesel districts with a total load of around 35 MW.

Energy Analects
Don Mills, Ontar
20 June 1988

B.C. Hydro issues call for private power

In keeping with British Columbia Premier Bill Vander Zalm's privatization initiative, the British Columbia Hydro and Power Authority is asking the private sector to fund up to $1-billion worth of new electricity generation, most of it to supply the growing U.S. export market. Judging by the response so far, the utility will have little trouble meeting its goal.

At Canada's first annual Electric Energy Forum, B.C. Hydro chairperson Larry Bell announced the utility was preparing to invite private sector proposals for the development of up to 600 MW of generation, requiring an estimated $1-billion investment. About 400 MW of that capacity could be committed to a power deal currently under negotiation by B.C. Hydro and two Washington utilities. The balance would go towards future in-province requirements.

In addition, B.C. Hydro would "look increasingly to the private sector for options to meet future loads," Bell told the forum, held earlier this month in Richmond, B.C. Bringing the private sector into the electricity generation business will "stimulate economic development and at the same time protect [B.C. Hydro's] domestic customers from the costs involved in large-scale power development," Hydro official Peter McMullan said. Detailed proposals will be accepted beginning this fall.

The announcement, a first for B.C. and for private generation in Canada, is consistent with policy currently being developed by B.C.'s provincial government. Under the proposed Hydro and Power Authority Privatization Act, a provincial power export agency would oversee B.C.'s electricity exports to the U.S. *(see EA May 23)*. B.C. Energy Minister Jack Davis has said such an agency would sign up U.S. utilities and then contract a private producer in Canada to supply the electricity for export.

Bell identified several domestic and export markets that could be served by private generation. The largest deal would involve the sale of up to 1,000 MW of capacity to Washington Water Power and Puget Sound Power and Light. B.C. Hydro says the deal, which would require new transmission lines on both sides of the border, would provide for up to 400 MW of power from private sector-funded projects. Private producers would have to put up $600-800 million and could expect gross annual sales of about $100 million, Bell said. The new transmission lines would allow B.C. to export electricity directly to the two potential customers, bypassing Bonneville Power Administration's (BPA's) grid. (B.C. Hydro is currently negotiating with BPA for a trial firm electricity sale but has so far been unsuccessful in gaining firm access to the Pacific northwest electricity market.)

The most likely candidates for supplying private sector power under the deal are two coal companies in southeast B.C. Westar Mining is proposing a 600-MW coal-fired electricity plant at its Balmer mine. The plant would be fueled by waste coal, of which Westar has a 30 million-tonne stockpile, and would cost an estimated $700 million. A scaled-down version is also being considered.

However, before such a project went ahead, the company "would have to have a guaranteed market" for the plant's output, Westar President Peter Dolezal told EA. Westar, which has been put on shaky financial ground in recent years because of low coal prices, would likely seek investors to help back the project. Dolezal described the province's push for private investment in electricity generation projects as a "very positive move," adding that, considering Alberta's success at turning low-grade thermal coal into cheap electricity, the coal-fired generation option is "a logical way for B.C. to go."

B.C. Hydro's announcement also puts Fording Coal's plans for a smaller coal-fired station on the front burner *(see EA April 18)*. Fording has proposed a 110-MW plant to be fueled by waste coal from its Fording River mine. The base cost of producing electricity from either project would be slightly below the 3¢/kWh average generation cost of the proposed 900-MW Site C hydro plant on the Peace River, according to Davis.

Alberta's TransAlta Utilities is also hoping to expand electricity sales to B.C. Hydro, possibly under firm U.S. export deals. TransAlta has said that existing plants and the second generating unit under construction at Sheerness could satisfy additional sales, but the company has also considered building a separate station for the export market. TransAlta currently sells $5-10 million of interruptible electricity to the U.S. via B.C. Hydro.

Proposal call issued for non-grid generation

On the domestic front, B.C. Hydro will issue a proposal call for 100-200 MW of private generation, with an eye to reducing generation costs in remote areas that are not connected to the province's electricity grid. Possible deals are under negotiation with Queen Charlotte Power Corporation to provide small hydro power to the Sandspit area, and with Westcoast Energy for a 50-MW gas-fired plant to serve the Fort Nelson area. "We believe there are economic alternatives out there that private suppliers will be better able to exploit than Hydro and that a competitive bidding process will bring out the feasible ones," Bell said. Currently, B.C. Hydro serves several remote areas with expensive diesel generation. The utility is also negotiating with Alcan Aluminium for additional power from its Kemano dam expansion *(see EA April 11)*.

To negotiate purchases from private power producers for domestic use, B.C. Hydro has drafted a new policy to be reviewed during the summer and implemented this fall. Under the policy, the purchase price for electricity from projects above 5 MW would be negotiated, taking into account reliability and duration of supply, and transmission requirements. The price would fall between B.C. Hydro's "estimated short term and long term marginal costs of electricity, and reflect the values of firm and secondary energy." The purchase price could be either adjusted annually based on changes in the utility's marginal costs, or fixed over a number of years following negotiation. For projects below 5 MW, the utility will pay 2.5-3.0¢/kWh for a minimum 20-year contract, with the price indexed to changes in the utility's marginal costs.

B.C. Hydro says it is willing to help finance private power projects as long as the "expected total costs to B.C. Hydro over the term of the agreement [are] lower than the estimated cost of electricity from other sources."

Fort Nelson News
Fort Nelson, B.C.
20 June 1988

New hope seen for turbine project at dam in Castlegar

By BARBARA TANDORY

Castlegar's long-cherished dream of hydro-electric power on the Hugh Keenleyside dam upstream on the Columbia River may yet be realized before the end of this century.

Larry Bell, chairman of B.C. Hydro which operates Keenleyside under the Columbia River treaty, said in March that the project would start in 1996 and be finished by 2001, dashing local hopes for a swift start to the proposed construction project, which would add generation facilities to the storage dam.

But last week, New Democrat energy critic Glen Clark said his party would make the installation of turbine generators a high priority if they win the next provincial election. Meanwhile, Castlegar Mayor Audrey Moore said she had already met with a private developer interested in the project.

Moore told a Castlegar chamber of commerce meeting Thursday that she discussed the proposed power development with a private energy contractor from eastern Canada — whose name she declined to divulge.

"I met with this chap (June 10)," she said, adding that she took the intitiative after Hydro chairman Larry Bell announced the Crown corporation would call for private proposals to develop generating projects of up to 600 megawatts, as part of the provincial government's privatization drive.

Moore said this push offers new hope for the project, which would be the biggest development project in Castlegar since Keenleyside was build in the 1960s, and would provide large-scale revenue and employment.

During a short visit to the area Wednesday, Callkr said a New Democrat government would set new Hydro priorities by moving away from mega-projects and toward smaller projects like the Keenleyside, as well as the proposed Murphy Creek dam on the Columbia between Castlegar and Trail.

Because adding turbines to the Keenleyside would increase production of electricity with no additional flooding, "it makes environmental and economic sense. The Keenleyside...is really a high priority for the NDP," he said.

However, Clark declined to commit his party to an immediate start-up on the dam. "We have a surplus of power; we're not looking at it as an immediate project, but (it's) high on the agenda" — ahead of the proposed Site C dam on the Peace River, for example.

Clark was critical of Social Credit legislation allowing Hydro's Vancouver and Victoria gas divisions, indicating this could mean higher prices for consumers already committed to the purchase of natural gas because they have already purchased gas stoves and furnaces.

However, he congratulated local residents on having affected provincial policies. The bill allowing gas utility privatization limited private ownership of B.C. utilities to 20 per cent, Clark said this limitation was imposed as a direct result of Kootenay and Okanagan residents' publicly-expressed outrage over last year's sale of West Kootenay Power and Light to the American firm UtiliCorp United, based in Kansas City, Missouri.

Through a subsidiary, UtiliCorp is one of the bidders for Hydro's coastal gas divisions. While the government's bill allowing the sale of these divisions eliminates the immediate danger of another 100 per cent UtiliCorp takeover, "it still makes it possible for them to be a major player," Clark says.

Fort Nelson News
Fort Nelson, B.
22 June 1988

Westcoast may supply power for the community

BC Hydro will soon invite private power producers to submit proposals for the development of up to 600 megawatts (MW) of generation representing potential direct investment of about $1 billion.

Announcing this at the opening of Hydro's first annual Electric Energy Forum, Chairman Larry Bell said that Hydro will look increasingly to the private sector for options to meet future loads.

"The more we learn about this trend in the industry the more convinced we are that this will lead to greater efficiencies and innovation. However the private power industry in BC is still in its infancy and we must move cautiously to ensure that quality projects are built which will save customers' money in the short term as well as provide long term security of supply," Bell said.

He added that Hydro currently saw four ways to start development of private power production and would be calling for proposals this fall, with specific options for export, domestic supply, diesel replacement and cogeneration with demand-side management another avenue for private sector innovation.

"By the mid-1990's we expect export opportunities to develop in the Pacific Northwest with either or both of Washington Water Power and Puget Sound Power and Light," Bell said.

A proposal call will be issued for approximately 400 MW of generation to determine the costs of serving this potential export market. At the same time Hydro

Continued on page 8

Continued from page 7

will be exploring contract terms with potential purchasers.

"Investment to serve this market would be $600 to $800 million in today's dollars generating gross annual returns of more than $100 million," he said.

On the domestic scene, Hydro's Twenty Year Resource Plan calls for co-generation energy from outside Hydro's integrated system. To stimulate development of this resource and learn more about how to deal with the industry Hydro will issue a proposal call for between 100 MW and 200 MW this fall. According to Bell this will represent direct investment of between $100 and $200 million.

"This could be in the form of one large project or several small ones. We won't really know about the market until we ask for specific proposals. However, based on enquiries to date, we could be pleasantly surprised by the amount of cost-effective energy available," he said.

Bell continued that subsidies paid by customers on the integrated system to Hydro's non-integrated or diesel supply areas cost millions of dollars each year.

"We believe there are economic alternatives out there that private suppliers will be better able to exploit than Hydro and that a competitive bidding process will bring out the feasible ones. We are currently finalizing negotiations with Queen Charlotte Power Corporation to provide small hydro power to the Sandspit area at considerable savings over the cost of diesel."

Bell went on to say that Hydro would call for proposals this fall for supply to specific non-integrated areas. These proposal calls could include requests for expressions of interest in community-based acquisition of total supply and

Continued on page 9

Continued from page 8

distribution responsibilities on a basis that will be equitable to both integrated and non-integrated system customers.

He also announced there were "increasingly strong signs" that a major pulp mill investment may be forthcoming for Fort Nelson and Hydro would be issuing a proposal call for service to Fort Nelson to serve either the present load of about 15 MW or this load plus a CTMP pulp mill estimated at 50 MW plus additional growth in the town.

"While integration via a transmission line has been assumed to be the most economic supply alternative to serve extra load in Fort Nelson there are indications that other options may be less costly. Westcoast Energy, for example, has presented us with an attractive prefeasibility proposal which appears to offer significant advantages.

"With the location near the gas fields and efficiency developments in gas turbine generation, it is conceivable that both integration and independent power supply could occur with Fort Nelson actually exporting power to the grid." Bell estimated investment in the power plant would be about $100 million. The transmission link has been estimated at about $65 million. A proposal will be invited to ensure all the ideas are on the table before a decision is made to go ahead."

Hydro provides service to 11 diesel districts with a total load of around 35 MW. One, Stewart, is in the process of integration.

Capital News
Kelowna, B.C.
25 June 1988

Power proposals wanted

B.C. Hydro will soon invite private power producers to submit proposals for the development of up to 600 megawatts (MW) of genertion representing potential direction investment of about $1 billion.

Chairman Larry Bell said that Hydro will look increasingly to the private sector for options to meet future loads.

"The more we learn about this trend in the industry the more convinced we are that this will lead to greater efficiencies and innovation. However the private power industry in B.C. is still in its infancy and we must move cautiously to ensure that quality projects are built which will save customers' money in the short term as well as provide long term security of supply" Bell said.

He added that Hydro currently saw four ways to start development of private power production and would be calling for proposals this fall, with specific options for export, domestic supply, diesel replacement and cogeneration with demand-side management another avenue for private sector innovation.

"By the mid-1990's we expect export opportunities to develop in the Pacific Northwest with either or both of Washington Water Power and Puget Sound Power and Light."

A proposal call will be issued for approximately 400 MW of generation to determine the costs of serving this potential export market.

The Province
Vancouver, B.C.
08 July 1988

'Small hydro' big success

anadian Press

TORONTO — Entrepreneurs have found at small can be beautiful in the field of ydroelectric power, despite the overwhelm- g presence of electricity giant Ontario ydro.

The ranks of these "small hydro" busi- ss people have grown so much that they athered for a conference this week in oronto.

On various rivers across Ontario, these business people are building or refurbishing small electric plants and selling the power to Ontario Hydro.

"We're expecting big things from small hydro in the 1990s," Ontario Hydro chairman Robert Franklin told delegates. "We're counting on it to help provide Ontario's energy needs."

But the ventures aren't gold mines, says Ron Dodokin, a lawyer from Georgetown, Ont., about 20 kilometres northwest of Toronto. He's building three plants; including one on the Serpent River, 130 kilometres west of Sudbury.

"We're businessmen," he says.

"We see a business risk that's acceptable and an investment risk that's acceptable, but it's a long-term return. In order to prosper, you have to be willing to stick around."

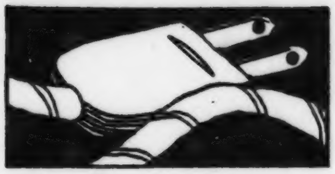
The pay-back period is about 15 years, he noted.

Twenty-two private projects are now selling power to Hydro, which combines it wi its own electricity in the provincial gri Another 37 are being built or proposed.

Franklin acknowledged that Ontar Hydro, the provincially owned corporati that has had a monopoly on power distrib tion, has resisted efforts to permit oth power producers to sell into its grid.

Even though the giant utility has beco more accommodating in the past two yea critics say Hydro could do more.

The Sierra Report
Victoria, B. C.
Sept/Oct 1988



LIGHTING THE WAY TOWARDS CONSERVATION... B.C. Hydro's New Direction

by John Condit

B.C. Hydro and Power Authority provided the platform for a dazzling report of new advances in energy saving — and received a gentle chiding over the modesty of its own conservation goals.

The occasion was Hydro's and the B.C. Ministry of Energy, Mines and Petroleum Resources' first annual Electric Energy Forum, held June 9-10 in Richmond's Delta River Inn.

At the same time, the government-owned utility was warned of pitfalls in the power export and privatization policies of its political bosses.

Amory Lovins, consulting physicist and director of research at the Rocky Mountain Institute in Colorado, called by Newsweek one of the world's most influential energy thinkers, described the revolutionary new ways to save energy. "Most of the best electricity saving technologies on the market today did not exist a year ago, or at least were not available," he told the forum.

Lovins' catalogue of wonders included an 8½-watt lamp doing the work of a 75 watter; reflectors and new electronic ballasts that can be adjusted to put light where it is needed, dimming automatically and reducing power consumption by up to 76 per cent; Polaroid material cutting glare so that you can see with half as much light; a house heated by an invisible film that insulates twice as well as triple glazings; improved industrial motors and drive trains saving half the drive power as well as reducing down time; overall cuts in industrial industry costs sufficient to create a corporate profit margin.

Compact fluorescent lamps save money in lamps and trips up ladders because of their 10,000-hour life, Lovins said. He put together a modular version as he talked. With a ballast adaptor and a lamp that could be in varied sizes, it became the 8½-watt pressed aluminum reflector lamp, replacing roughly a 75-watt incandescent. "I can make it into any of 15 kinds of decoratives for restaurants, cut-glass globes, or whatever else you want." Lovins called the fixtures in the ceiling of the hotel meeting-place "cash cows ready to be milked" with improved lighting. "This is not a free lunch; this is a lunch you are paid to eat."

"Most of the best electricity saving technologies on the market today did not exist a year ago, or at least were not available."

Amory Lovins

Lovins' own 400-square-metre house is a model for energy savings, although some technology used, he said, was now outmoded. He heats his house with what he called an argon-filled heat mirror — an infrared reflecting but visually transparent film suspended in the windows. The building has no furnace; it uses considerably less than 1 per cent of the normal amount of heat... "We do have a couple of wood stoves, which are very rarely used. If we used them significantly, we would roast. In a very bad winter, for example, our first winter, we had 39 continuous days of cold, cloud and snow, and we might burn half a cord of soft wood... and a good chunk of that for aesthetics." The Lovins have a portable electric space heater as backup. Air to air heat exchangers reduce indoor air pollution.

A greenhouse offers tomatoes in January as well as papayas, avocados and bananas. The bounty can be stored in a freezer and refrigerator which, said Lovins, use respectively 8 and 15 per cent of the normal amount of electricity.

He summed up the potential savings at pretty close to an astounding three-quarters of all U.S. electric use at a price under a cent and probably closer to half a cent per kilowatt-hour. He cited a whole community — Osage, Iowa — as cutting demands on its municipal utility by insulating buildings and, in a hard-up area where electric bills count, paying off its debt, building a big surplus permitting cash purchase of new transmission facilities. As a result, Osage's utility reduced its rates by a real 32 per cent. He also cited major cities gearing up for mass retrofitting of commercial lighting.

Power companies, running into the high costs of new generating plants and with major damsites all taken, are giving away lamps, modernizing industrial plants, and selling conservation programs. Lovins suggested that builders should pay a $10,000 hookup fee if they build "a typically inefficient all-electric sieve", because they are foisting increased generating capacity costs on the public.

B.C. Hydro summarized its own customer-implemented conservation program, embodying techniques at least parallel to Lovins' descriptions, that would create the equivalent of 3,890 gigawatt-hours (3,890 billion watt-hours) by 2007-8. The saving would be about 5.7 per cent of the mid-range probable load of 67,930 GW.h. It was Ralph Cavanagh, senior staff attorney and North West Energy Project director for the Natural Resources Defence Council, San Francisco (described as having 85,000 members and contributors), who, while praising Hydro's direction, found its goal overly-modest.

"Your problem is that you have been arriving in California — or, worse still, in Los Angeles — saying, in effect, 'Pay us to dam a river for you.' "

Ralph Cavanagh

"I am absolutely confident, and I think Hydro by and large would agree with me, that you are going to be able to do a great deal better than that. Mr. Lovins will be trying to convince you that you ought to be setting the number at 50 per cent or more."

Said Cavanagh: "Your problem is that you have been arriving in California — or, worse still, in Los Angeles — saying, in effect, 'Pay us to dam a river for you.' " This means government delays in the U.S. because of needs to wheel the power through a reluctant Bonneville Power Administration (BPA) and opposition by environmentalists in both Canada and the U.S. To them, he said, "California's willingness to export its environmental costs is the stuff of legend — legend that happens to be true."

With either new thermal or new hydro power costing substantially more than the existing resource base, he said, B.C. would be better off exporting 4,700 gigawatt-hours of conservation than producing the equivalent by building Site C dam on the Peace River.

But Cavanagh also warned of a highly competitive power market. Confirmation came from Bob Mussetter a member of the California Energy Commission, who warned Hydro that by putting out a call for small hydro and other alternative energy sources — as B.C. Hydro is now doing — California had overpaid these non-utility producers by billions of dollars in subsidies. He urged: "Don't set prices without setting a quantity limit on it; that's essentially the mistake we made."

He also spoke of "a big gob of politics involved". The forum itself showed signs of the pressures to come from the new private producers to increase prices paid for their power and stimulate increased output, possibly conflicting with conservation aims. For British Columbians, in short, the rub may be that runaway privatization and power exports being pushed by the Vander Zalm government will undercut the potential gains.

Small hydro producer Guy Coats, who has signed with Hydro to supply six megawatts of power on the Queen Charlotte Islands, said he hoped to convince Hydro to offer a better price, and Arie van Donkelaar, energy co-ordinator for Cariboo Pulp and Paper, said his company as a thermal plant co-generator, would install larger capacity generators if Hydro would up its rates.

Meanwhile, Hydro has announced ongoing negotiations to sell power to the Washington Water Power Co. and Puget Sound Power and Light. Could this be an end run around BPA in keeping with an old dream of power companies to control a non-governmental energy highway south? Belonging to an extraordinarily powerful U.S. lobbying network, Washington Water Power and Puget Power, along with the new U.S. owners of West Kootenay Power and Light, could be formidable new boys on B.C.'s political block.

John Condit is a retired journalist and editor with a long-time interest in public power in both Canada and the U.S.

Hydro's big projects all for the next century...

B.C. Hydro's 20-year resource plan relies on demand-side management (energy conservation through customer-implemented programs), improved utilization of its system and of present resources, increased reliance on purchases, and co-ordination agreements to postpone the need for new generation projects until after the turn of the 21st century.

Hydro looks to the demand-side management programs to produce the equivalent of 3,890 gigawatt-hours (GW.h) by 2007-8; to co-ordination of Columbia River projects with the Bonneville Power Administration for 1,300 GW.h; to an agreement with Alcan to produce 3,000; and to return of Columbia River Treaty downstream benefits from the U.S. — upon which Hydro appears to have its fingers crossed — for 4,800 GW.h by 2003.

The entitlement to downstream energy benefits resulting from water storage at Duncan, Arrow and Mica projects in Canada was sold for 30 years from start of operation of each project. The 30-year periods begin to expire in 1998-99.

Hydro said it would buy energy from private producers, including co-generators (industries producing power for their own use but with energy to spare), provided there would be no "negative impact on Hydro's rates," which the utility boasts as among the lowest in North America.

Site C on the Peace River could kick in with 4,700 GW.h in 2001; a Keenleyside dam powerplant and a Murphy Creek project on the Columbia in 2004 with 1,160 and 1,450 GW.h, respectively, and a Hat Creek coal mine and thermal plant producing 11,800 GW.h by 2006.

Listed also as the most economic available projects are a Stikine-Iskut rivers project that could contribute 15,600 GW.h in 2003 and a Liard River projects adding 18,400 in 2008.

System demand could grow from 38,139 GW.h in 1986-7 with a peak demand of 6,467 megawatts (6,467 million watts) to a mid-range probable 67,930 GW.h in 2007-8 and a peak of 11,990 MW.

John Condit

B.C.Hydro News

ELECTRIC ENERGY FORUM EXTRA!

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Amory Lovins (left), director of the Rocky Mountain Institute, was one of the featured speakers at the First Annual Electric Energy Forum. Highlights of Mr. Lovins' remarks are on page 4. Close to 350 people attended the two-day forum which was sponsored by Hydro and the Ministry of Energy, Mines and Petroleum Resources.

Forum probes future DSM and supply options

The first annual Electric Energy Forum on June 9 and 10 gave Hydro the opportunity to consult with customers interested in demand-side management and parallel generation.

Almost 350 people representing industry, environmental groups, potential parallel generators and other interested members of the public met at the Delta River Inn in Richmond to discuss efficient energy use and non-utility supply. They heard presentations by speakers representing large utilities, small hydro, public advocacy groups, and industry.

The ideas generated at this forum will help Hydro in developing alternatives to meet future load growth. No longer does the construction of traditional, high-cost generating facilities appear to be the only way of meeting energy demands.

Highlights of the forum as well as the reaction of participants are captured in this special edition of B.C. Hydro News. The material was prepared by Kenna Hoskins, a broadcast journalism student working this summer with Corporate Communications.

Hydro to invite private proposals for up to 600 MW

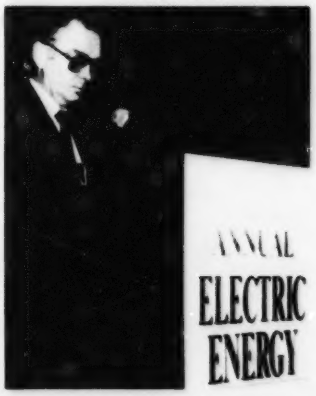
B.C. Hydro will soon invite private power producers to submit proposals for the development of up to 600 megawatts of generation representing one billion dollars of direct investment.

Chairman Larry Bell made this announcement at the opening of the Electric Energy Forum. On the same day a draft policy on "Purchase of Electricity by B.C. Hydro" was released for public review. With this draft policy, Hydro hopes to signal industry that it's serious about seeking agreements with parallel generators. It provides industry with guidelines and allows them to comment before the policy is formally introduced.

Integral to Hydro's policy is the idea it must expose agreements with small hydro and other parallel generators to market forces. Mr. Bell said only in this way will Hydro be able to offer cheap electricity and in turn serve the provincial economy.

"The private power industry in B.C. is still in its infancy and we must move cautiously to ensure that quality projects are built which will save customers money in the short term as well as provide security of supply in the long term," Mr. Bell said.

The private sector will be asked to make proposals this fall with specific options for the domestic market both in integrated and non-integrated areas and for the export market.



Hydro chairman Larry Bell described upcoming opportunities for private power producers.

Export

"By the mid-1990's we expect export opportunities to develop in the Pacific Northwest with either or both Washington Water Power and Puget Sound Power and Light," Mr. Bell said.

A proposal call will be issued for approximately 400 MW of generation to determine the cost of serving this potential export market. At the same time Hydro will

continued on page 2

Bell outlines parallel generation opportunities

from page 1

explore contract terms with potential purchasers.

Domestic Supply — Integrated Areas

Hydro's Twenty Year Resource Plan provides opportunities to supply energy to the integrated system. To stimulate development of this resource and learn more about how to deal with the industry, Hydro will issue a proposal call for between 100 MW and 200 MW this fall representing between $100 and $200 million dollars of direct investment. This could be in the form of one large project or several small ones. No one knows for sure until Hydro gets specific proposals.

"We believe there are economic alternatives out there that private suppliers will be better able to exploit than Hydro and that a competitive bidding process will bring out the feasible ones," the Hydro chairman said.

Domestic Supply — Non-integrated Areas

Hydro will also be calling for proposals to supply specific non-integrated areas. Investment in the order of $15 to $20 million could result if all these remote areas can be supplied by non-diesel generation.

Mr. Bell referred to an agreement reached on the second day of the forum with the Queen Charlotte Power Corporate to provide small hydro power to the Sandspit area at considerable savings over the cost of diesel.

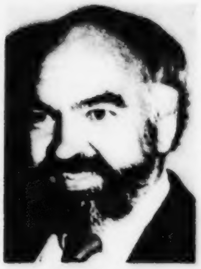
Mr. Bell said as well there were "increasing strong signs" that a major pulp mill investment may be forthcoming for Fort Nelson and Hydro would be issuing a proposal call to serve either the present load of about 15 MW or this load plus the CTMP pulp mill estimated at 50 MW plus additional growth in the village.

"While integration via a transmission line has been assumed to be the most economic supply alternative to serve extra load in Fort Nelson, there are indications that other options may be less costly," Mr. Bell said.

With the location near the gas fields and efficiency developments in gas turbine generation, it is conceivable that both integration and independent power supply could occur with Fort Nelson actually exporting power to the grid. Investment in the power plant could be about $100 million. The transmission link has been estimated at about $65 million. A proposal call will be issued to ensure all the ideas are on the table before a final decision.

"Jaws of Uncertainty" underscore planning range

Hydro's current resources combined with purchases from Alberta will meet energy demands until 1995, according to the Twenty Year Resource Plan. Beyond that year, new resources are required.



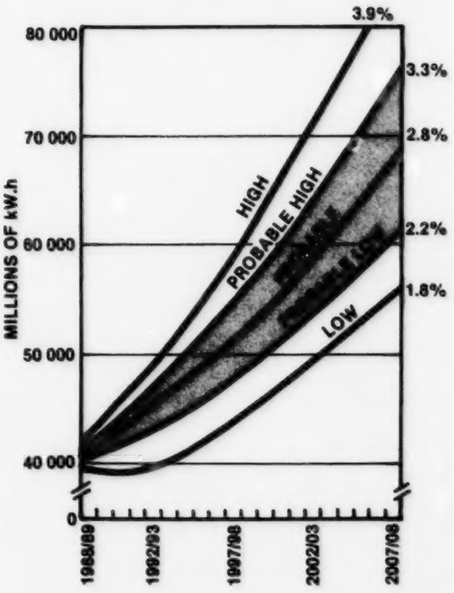
Peterson

In the past Hydro would have constructed a large generating facility to meet this projected demand. But times are changing. Like other large utilities in the United States and Canada, Hydro is looking at alternatives to delay construction. Increased reliance is being placed on coordination agreements with other power producers, demand-side management, and other efficiency measures.

A quick look at the Twenty Year Resource Plan:

The B.C. economy is forecast to average 2.9 per cent real annual growth over the period to 1997 and 2.8 per cent in the following 10-year period to 2007. This graph illustrates the uncertainty involved. Manager of Policy and Planning, Ken Peterson calls it the "Jaws of Uncertainty."

Range of Forecast Demands



Here is a look at the resources expected to fill this projected demand.

Year	Resource	Annual Energy Contribution
1998	Demand-Side Management Programs	Increasing to about 3000 GW·h by 2003
1989	Co-ordination of Columbia River projects with B.P.A.	1300 GW·h
1995	Co-ordination/purchase agreement with Alcan	3000 GW·h
1998	Return of Columbia River Downstream Benefits	Increasing to about 4800 GW·h by 2003
2001	Peace Site C	4700 GW·h
2004	Keenleyside	1160 GW·h
2004	Murphy Creek	1450 GW·h
2006	Hat Creek	11800 GW·h

The forum included panel discussions on demand-side management, parallel generation, and resource planning and forecasting. The panel above dealt with parallel generation. From left: Bob Mussetter, California Energy Commission; Chris Boatman, Hydro vice-president for Corporate Affairs; Arie van Donkelaar, Cariboo Pulp and Paper, and Ed Macgregor, Energy, Mines and Petroleum Resources.

Hydro's DSM projects are described

Demand-side management programs are expected to reduce electricity consumption by up to 3,000 GW·h annually. To achieve these savings, Hydro is designing and selling programs customzed for its residential, commercial and industrial customers. While advertising and promotion are sometimes enough, other times different strategies, like financial incentives, are necessary to encourage customers to adopt these programs.

Here are samples of the programs Hydro's Energy Management team has put together. Some are already in place, like Electric Plus; others are still in the pilot project stage.

INDUSTRIAL

Energy Efficient Motors and Drives

Strategy: to promote application of energy efficient motors and drives where financially beneficial through seminars, workshops, and normal contact with Hydro customers.

Energy Efficient Industrial and Street Lighting

Strategy: to promote benefits of high efficiency lightsources by providing technical literature and seminars.

Energy Audit Programs for Industrial Plants

Strategy: to encourage industrial customers to make efficiency improvements by providing the consulting services of engineers.

New Plant Assessment

Strategy: to assist prospective customers in increasing energy efficiency of new manufacturing facilities by making executives aware of the financial benefit.

RESIDENTIAL

Electric Plus

Strategy: to encourage residential and commercial customers now using oil or propane to switch to interruptible electricity by offering a discounted rate for this surplus energy. The customer maintains a back-up fuel system for periods when surplus is unavailable and supply must be interrupted.

Zak El-Ramly, supervisor of residential and commercial energy management, was one of several Hydro people who described our demand-side management initiatives.

Energy Saving Fluorescent Lamps

Strategy: to encourage business customers to replace 40-watt fluorescent lamps with 34-watt tubes by offering a 25-cent-per-lamp rebate and conducting an advertising and education program.

Hot Water Tank Jackets

Strategy: Hydro will supply and install, free of charge, an insulating jacket for tanks that need it.

Refrigerator Buy-back

Strategy: to give charities $25 for picking up and disposing of old operating refrigerators. Residential end-use surveys show 15 per cent of customers have two or more refrigerators. These 150,000 refrigerators consume 250 GW·h annually. In addition, the customer will receive a $25 rebate on the Hydro bill.

Understanding the jargon

Parallel Generation: Refers to any situation where a customer operates or generates "in parallel" with the utility supply. This parallel generation may or may not meet the customer's total electricity requirements.

Co-generation: A form of parallel generation where an industry requires steam for its production processes. The steam is also used to generate electricity, thereby increasing the overall process efficiency and providing the opportunity to produce most or all of the electricity it requires. Surplus electricity may be sold to the utility.

Co-ordination: Pooling resources and loads between utilities to allow peaks and valleys in load to be levelled.

Wheeling: Distributing energy for small power producers via the power grid. A large utility "wheels" energy for others.

Demand-Side Management: Influencing energy demand to better match energy supply. DSM programs promote efficient energy consumption so that energy is saved to satisfy future requirements and the construction of new power plants is delayed. In this way the cost of electricity is kept in check.

Load Shifting: Switching load from times when demand is heavy to times when it's light.

Strategic Load Growth: Encouraging more electrical use at key periods, such as at the time large new facilities come into service.

Strategic Conservation: Reducing the demand for electricity, usually to delay the need for new facilities.

The guest speakers

Hydro representatives at the Electric Energy Forum described our DSM and parallel generation policies and proposals. They then sat back and heard from others with similar experience, advice, insights — and criticism.

Unique perspective from BPA

Sue Hickey, marketing manager for the Bonneville Power Administration, says she's impressed by the ambition of the DSM program that Hydro is initiating.

Ms. Hickey offers a unique perspective since her federal agency has been encouraging American Northwest utilities to implement demand-side management programs for over seven years. She offers Hydro the benefit of BPA's past experiences, both their successes and failures.

"You've taken a different perspective, a more technology-oriented approach. We tended to package more things together — for example, residential retrofit which has included water, heat and weatherization all in one.

"You have a nice balance of some incentives but a lot of information, promotion and technical assistance. I particularly like the idea of the test of the new light bulbs. It's a really smart idea to do market tests. The more you can do the better off you'll be."

She also stresses the need to avoid lost opportunities by making sure new buildings are energy efficient rather than encouraging people to retrofit them later.

A step in the right direction

Ralph Cavanagh is the Northwest Energy Project director for the National Resources Defense Council. He's considered a leading spokesman for the environmental position in the U.S. Pacific Northwest. He admits "for much of the last decade I have been meddling uninvited in the affairs of B.C. Hydro."

To him, Hydro's new demand-side management policy is a step in the right direction.

"I want to commend B.C. Hydro for the leadership role it has taken in recognizing the role of conservation and DSM as a resource to be evaluated on equal terms with new generators."

But he wants to see Hydro push DSM to meet export requirements as well as domestic requirements. "The California buyer is not interested in buying a power plant from B.C. Hydro. What the California utility buyer really wants is a chunk of electricity undifferentiated by source, backed by the system, the management, the reliability of B.C. Hydro."

He also notes two benefits of DSM that are not immediately apparent. "It reduces a utility's uncertainty about future needs and resources", he argues, because the impact associated with errors in forecast is less severe if every square foot of new floor space uses less power. He also notes DSM acts like an accordian, expanding and contracting with need because conservation opportunities grow in accordance with economic expansion.

Sue Hickey

Ralph Cavanagh

Amory Lovins

Lovins gives credit but says go farther

Amory Lovins, Director of the Rocky Mountain Institute in Colorado, is an expert on improving efficiency. Newsweek calls him "one of the Western world's most influential energy thinkers".

"I think Hydro deserves great credit for the range and quality of these initial programs. I'm very impressed not only by the audience's response but also by the quality of people Hydro has working on the issue."

But he says Hydro isn't going far enough. "I think the savings are at least 10 times greater and several times cheaper than the initial exploration has identified. I think the programs can be significantly improved either by using different technologies or fine tuning delivery techniques."

To prove his point he offers some impressive evidence. He points to a 348-page "encyclopedia" published by his colleagues and himself which documents ways in which 92 per cent of electrical energy used for lighting can be saved by using different technologies. He says we can think of the savings as equivalent to the output of "60 Chernobyls in U.S. potential."

Mr. Lovins suggests B.C. manufacturers start producing energy efficient light bulbs. Manufacturers of such light bulbs have survived in markets as small as our own and until they are readily available on the market, efficient lighting programs will have difficulty going ahead, he says. It's an idea Hydro will be investigating, says chairman Larry Bell.

Clyde Coats

Arie van Donkelaar

Dick Gathercole

Hard for David to negotiate with Goliath

Small hydro producer Clyde Coats is proud of the agreement he signed with Hydro on the second day of the conference to supply six megawatts of power to the Sandspit grid on the Queen Charlotte Islands. But he's not as happy with the length of time it took his company and Hydro to come to this agreement.

"The average small hydro person is in no position to negotiate with B.C. Hydro. They're usually made up of less than 10 people. They don't have the money to carry on for months and months with negotiations." He suggests outside parameters be set up that both groups are forced to adhere to.

As an entrepreneur, Mr. Coats would like to convince Hydro that it needs to offer small hydro a better price for its energy production. He says Hydro's purchase policy "isn't even in the ballpark". "Mother Hydro doesn't really want small hydro to grow up and become a potential rival," he adds.

Forest industry needs rate incentives

Arie van Donkelaar is the energy co-ordinator for the Cariboo Pulp and Paper company. His company, as a co-generator, is using wood wastes unsuitable for pulp production to help fuel their mill.

Mr. van Donkelaar notes the current rate structure doesn't include incentives for companies like his own to sell excess power back to Hydro. He says if this rate structure could be revised, much larger capacity turbo generators would be considered for inclusion in pulp mill designs.

"It is clear the forest industry can be an interested partner in parallel generation. Long range economic considerations and effective rate structures can help to bring this about. It is hoped that B.C. Hydro's efforts in parallel generation will open fresh opportunities to the various regions of the province and that the Quesnel area will be one of them."

Gathercole surprised to be asked

Executive director of the B.C. Public Interest Advocacy Centre, Dick Gathercole, seems somewhat surprised he was asked to speak at the forum. After all Hydro and Dick Gathercole haven't always seen eye to eye. He says he spent most of the last seven years trying to pry information out of Hydro at regulatory hearings.

"I think Hydro is going in the right direction. Parallel generation and other alternatives are things we've been arguing we should be doing for seven or eight years now." He goes on to suggest these alternatives should prevent construction of Site C altogether.

He says a parallel generation policy that makes sense should incorporate at least four factors:

1. "Development of parallel facilities must be part of an overall planning process." He refers to a least-cost planning approach in vogue in the United States where all options are weighed for cost-effectiveness.
2. "Parallel generating facilities must make economic sense to B.C. Hydro and its customers. There's no point in encouraging the development of alternative facilities if it can obtain the energy at a lower cost or more likely through alternatives like DSM."
3. "Social costs of pollution and environmental considerations have to be included in the evaluation of generating alternatives."
4. "Parallel generation should be used to meet domestic demand or to firm up interruptible surplus for export sales." He says he doesn't support building facilities for the export market, fearing Hydro's domestic customers would subsidize export customers.

Mr. Gathercole represents the interests of the residential customer. For this reason he disagrees with Clyde Coats' position that Hydro should be offering private producers a better price.

The varied California experience

Bob Mussetter offers an insight into California's experience with small hydro and many other alternate energy sources. Mr. Mussetter, a member of the California Energy Commission, begins with a warning for Hydro:

"If you take the public advocacy lawyer, you mix his message up with the message from the small hydro producer and then get a big glob of politics involved, you run the risk of coming out of this the way we have."

He's referring to the three to seven billion dollars he estimates California overpaid to non-utility producers in the

continued on page 6

Bob Mussetter

from page 5

form of subsidies. He advises "don't set prices without setting a quantity limit on it; that's essentially the mistake we made."

He explains California set out to develop alternative sources of energy during a time when everyone worried about an energy deficit. The terms they offered were so lucrative they got 15 thousand megawatts of contracts of which only five thousand are on line today.

The proposals they received offered an interesting variety — wind, solar, thermal, biomass, and geothermal in addition to more traditional methods. For example Mr. Mussetter says they have several solar projects on the desert. "They are parabolic mirrors that collect heat. Each one of these occupies 160 acres and they're building them by the square mile." He adds, "We pay these generators nine cents a kilowatt hour."

Bob Mussetter

Hedley Palmer

Hon. Jack Davis

Davis outlines Hydro's future role

The Honourable Jack Davis outlined how the Ministry of Energy, Mines and Petroleum Resources perceives Hydro's future.

"The big job Hydro has in the future is to own and operate the power grid," Mr. Davis said. "It also has the retailing and distribution to do. The private sector role will largely be new generation.

"We're leading the nation in opening up electric utility grids to wheeling opportunities so developers of power can sell some of their energy to a location across Hydro's system.

"Hydro has to be kept whole financially... It will have as it's core market the residential consumers, the small and medium size commercial establishments, and small business. They are the people who have the right to receive Hydro's energy at average cost. But anyone outside this core market will have to buy their energy on a market-determined basis."

Mr. Davis also spoke about new plans for exporting energy.

"It's our determination, through a subsidiary of Hydro to set up a desk at the border, a single-window approach, to access sales to the U.S. ... We've never really exported power in a big way or built a plant deliberately to serve the U.S. market or any neighboring jurisdiction. One reason was our costs were higher than rates in the Pacific Northwest. Now they're roughly comparable. We're moving into a new era of export opportunity."

"We plan to call for expressions of interest after having determined a market, then look for sources. We then hope to make a profit by buying from these sources in the province. It's a new market-related approach."

Palmer brings advice from Ontario Hydro

Hedley Palmer, director of Market Services and Development for Ontario Hydro, has plenty of advice for his counterparts in B.C. Ontario Hydro, like us, is in the middle of implementing parallel generation policies.

Mr. Palmer sees corporate commitment and action as essential ingredients in a successful policy. He stresses the corporation must be seen as a willing, enthusiastic buyer of power from private generators and he goes onto suggest how this should be done.

"The smart utility, I think, will concentrate the responsibility for parallel generation in one group. And that group has got to have responsibility for co-ordination, development and recommendation on all essential details of parallel generation policy to provide a single point of contact for all parallel generators."

The price a utility is going to pay has to be a reasonable reflection of its cost of getting power from an alternative source and of the costs a private generator incurs, he believes.

He echoes Mr. Coats when he says, "most potential power producers approach the utility with all the enthusiasm of going to the dentist." For this reason he says it's necessary to enhance lines of communication with the corporation's decision makers and it's necessary to provide standard rates and contracts which can then be altered to fit individual needs.

DSM potential impresses critic

N.D.P. energy critic, Glen Clark, says this kind of forum is long overdue. He is particularly impressed with the potential for demand-side management.

"It's really encouraging in terms of savings to ratepayers and in terms of deferring big projects like Site C which don't make economic sense. It's nice Hydro is finally looking at options."

But he has some reservations about parallel generation for export. "I'm concerned politics will again intervene at B.C. Hydro and they'll push ahead a new project for political purposes rather than economic ones."

In general he thinks these are the most encouraging developments he has seen at Hydro and he hopes that the practice lives up to the policies expressed by the speakers.

Summing Up

. . . from Clearing Up

Cyrus Noë is the publisher of "Clearing Up", a weekly newsletter published from Seattle that is devoted to energy issues in the western United States and Canada. This column is reprinted, with permission, from the June 17, 1988 edition.

Here Come the Privates on A (Sort of) Level Playing Field. It was agreed publicly and privately that B.C. Hydro under CEO Larry Bell is not the defensive and distant dinosaur of old — these remarks and declarations taking place at the end of the First Annual Electric Energy Forum in Richmond, B.C.

One of the signal events of the forum was the noon-hour appearance of Jack Davis, the government's Minister of Energy, Mines and Petroleum Resources, to take the assembled forumeers on a walk around the BC resources barn. The Energy Minister spoke in general terms; it was not a major policy address. But he did lay out for all to see an open wheeling policy, calling B.C. Hydro "the first utility in North America to open up its grid for wheeling." The price is designed to make sure that Hydro does not lose money on that account, which would in effect, sources say limit the wheeling to new loads.

In U.S. parlance, the forum dealt with conservation and cogeneration. That the big British Columbia public utility has much of an interest in either one of these procedures continues to amaze a lot of people who have the utility filed under the "bigger and better builder" category. Indeed, I remember attending a conference last year in Olympia where Chairman Bell laid out an awesome British Columbia generating resource potential, both hydro and thermal; I lost count at 6,000 MW. Now Hydro is actively pursuing conservation and has decided to invest as much as a billion dollars in private cogen resources delivering an estimated 600 MW.

Of course, Site C Dam on the Peace River is still a gleam in the eyes of some people at the utility, but it is signficant to note that the 600 MW figure cited by Bell as the cogen purchase goal is just less than the estimated energy output of Site C, and the $1 billion/Canadian price tag for the cogen resource compares very favorably with an estimated $3.2 billion/Canadian for Site C at completion. Paper bargain or not in comparison to Site C, buying power from the private sector in British Columbia is perceived in very different ways. Seen in the context of the announced intention of the Social Credit party government to peddle the utility's gas division to private interests, the private generation purchases are perceived as examples of Premier Bill Vander Zalm's predilection to favor private business.

Note in this connection the *Vancouver Sun* editorial calling the idea "dubious", terming it a "privately owned power industry" and seeing it as an intention to build for export at the expense of domestic ratepayers. None of these things is true on the face of it, and the *Sun's* editorial writer did not know about or take into account situations that were made manifest at the forum. One was the opinion of the private developers that B.C. Hydro was not particularly sensitive to the pecuniary needs of independent power developers.

A case in point was Clyde Coats of the Queen Charlotte Power Corporation, who had just finished (by his description) arduous negotiations with Hydro on a 6 MW hydro plant on the Queen Charlotte Islands. Coats seemed to think that Hydro had a very sharp pencil when it came to cutting a deal with a small power producer. He took the position that Hydro wanted to pay less than the amount "economic reality" should require the utility to pay the small generator. Coats argued that B.C. Hydro "should pay total displaced costs (i.e., avoided cost) with interest" for independent power. Coats had no interest in other methods of determining price, such as share-the-savings and return on equity. "You couldn't get a taxi to take you home on a return-on-equity basis," Coats said.

What Coats wanted was the proverbial level playing field with Hydro, where a business environment prevails, where policy is stable and where "economic reality" obtains. Not the case now, Coats believes; the playing field for trade with the U.S., for all its problems, is by comparison with the B.C. Hydro pitch " as flat as a billiard table".

If B.C. Hydro intends to give opportunities to coin money at ratepayer expense to private producers, directly or by cogeneration, that apparently is news to the private energy people who, by the looks of the attendance list, were the vast majority of those at the Delta River Inn conference room.

continued on page 8

Summing up . . .

from page 7

Lest there be any doubt that B.C. Hydro wanted to extend the hand of business to the privates on its own economic terms, Chairman Bell took the stage at the end to make a couple of things clear.

He wanted it known that B.C. Hydro's primary obligation remained the mandate of serving customers economically; he might as well have said on a least-cost planning basis. He said that so far as he was concerned, conservation was the exact equivalent of generation. And he said the private generation initiatives made so much of at the forum needed to be seen in that context. "Because I want to tell you," Bell said, "that it's not a social program. We have to be aware of transaction costs." Moreover, it might be that B.C. Hydro will be able to respond to only about 10 per cent of the private generation proposals that come in over the transom. And it is clear Bell was not too fond of the level playing field metaphor. "We hear a lot about a level playing field," he said. "But this is not a game of fairness, it is a game of competition."

Nothing else would make much sense to B.C. Hydro; as so [illegible] happens, it is economics, not ideology, that makes converts. The National Resources Defense Council's Ralph Cavanagh and Rocky Mountain Institute's Amory Lovins, forum participants, both insist that conservation and alternatives to big generation make economic sense first of all. It is obvious as well that in its negotiations for power or on wheeling the utility still must seek to protect its revenues. Converted dinosaur or whatever, one cannot expect the utility to shoot itself in the pocketbook for conservation or private initiative — not with a utility that has a 80 to 20 per cent debt-to-equity ratio.

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Planning for next year

Now that the first annual Electric Energy Forum is over, plans are being made for a similar one next year. The successes and shortcomings of this forum are being taken into account.

Conrad Guelke, Hydro's manager of Corporate Planning and Review, was in charge of organizing this event. "Most of our objectives were met and we learned a lot," he says. "Now we have to repeat the performance and improve upon it."

Next year, one of his primary concerns will be to allow more time for feedback from the participants. He says the forum did a good job of laying out information, but Hydro has to find innovative approaches for facilitating discussion.

The feedback from questionnaires was favorable, he says. Comments by participants suggest everyone found it beneficial. One person said he now no longer finds Hydro a faceless organization.

Mr. Guelke notes two keys to the success of this forum. First, it ran on time despite a tight schedule. Second, it was well-publicized thanks to efforts of Hydro employees from the different regions who personally phoned customers asking them to participate.

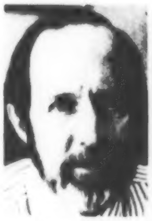
The next forum has been tentatively scheduled for May 11 and 12, 1989 at the Hotel Vancouver. Mr. Guelke says, "We can't be complacent. The challenge is to find speakers of the same calibre for the second annual Electric Energy Forum. Ultimately the future success of the annual electric energy forums will depend upon our ability to maintain and build upon the standards established at Richmond."

Thanks to the forum team

By Conrad Guelke

I would like to thank vice-president, Bill Best, who everyone agrees did an excellent job of chairing the forum. Mr. Best has recently been selected as the recipient of the Northwest Public Power Association's Life Membership Award for 1988. This award is given "in recognition of outstanding contributions in the interest of the Association and public power."

I'd also like to thank the team of over 60 people who, in one way or another, contributed to the organization of this forum — the first of its kind in Hydro history. Chairman Larry Bell says: "The two-day event can only be described as professional and first-class."


Guelke

Best

Thanks also to our panelists and speakers who did an excellent job of representing Hydro. They were chairman Larry Bell, vice-presidents Chris Boatman and John Sheehan plus Ken Peterson, Tim Newton, Jack Habart, Zak El-Ramly, Derek Henriques, John Elliott, Bruce Prior, and Don McFarlane.